THE

JOURNAL OF GAS LIGHTING,

WATER SUPPLY, & SANITARY IMPROVEMENT.

VOL. VIII. No. 176—11th YEAR.] LONDON, JULY 19, 1859. [Subscription per Ann. { 15s. in Advance / 18s Credit.] DOUBLE No. Price 1s.

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Further information will be given by Mr. E. BAGOT, C.E., LLANELLY.

By order, F. L. BROWN,
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The Advertisements to be sent to Mr. KING, Office of the JOURNAL OF GAS LIGHTING, 11, Bolt Court, FLEET STREET, NOT LATER THAN THE FIRST OF AUGUST NEXT.

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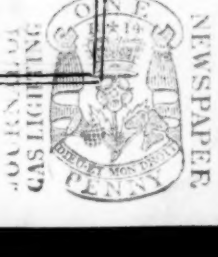

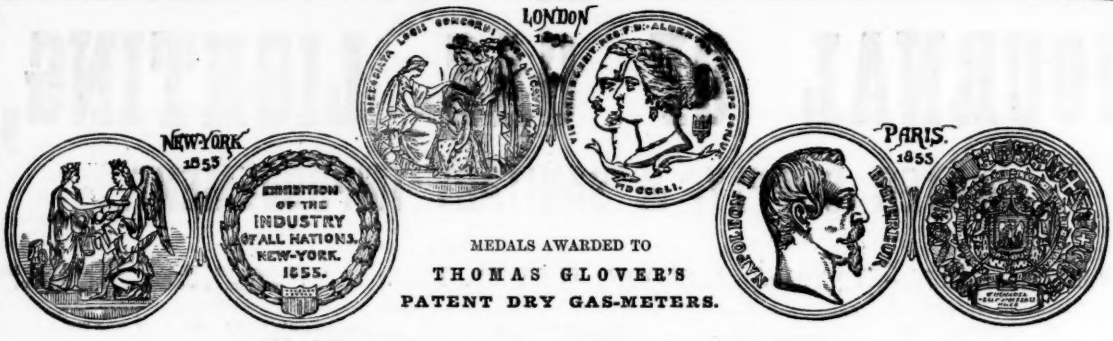

MEDALS AWARDED TO
THOMAS GLOVER'S
PATENT DRY GAS-METERS.

THOMAS GLOVER,

PATENT DRY GAS-METER MANUFACTURER,

SUFFOLK STREET, CLERKENWELL GREEN, AND
ALLEN STREET, GOSWELL STREET, E.C.

LONDON, March 25, 1859.

THOMAS GLOVER takes this opportunity of thanking Gas Companies and his other Customers for the very liberal support and patronage he has received during the past year, which has far exceeded his most sanguine anticipations, having sold a greater number of his PATENT DRY GAS-METERS since the dissolution of his partnership with Mr. Croll than he was ever previously enabled to do in any one year.

THOMAS GLOVER confines his sole attention to the business of Gas-Meter Making. The propriety of his doing so is satisfactorily proved by his success; and, without the practice of any quackery, or any attempt to delude the public by an absurd exhibition of "Old and New Valves," his Meters are in general use by the Metropolitan Gas and other Companies in this Country and abroad. For example, one Metropolitan Company have now in use above **12,500** of his Patent Dry Gas-Meters; some of these Meters have been fixed for Fourteen Years, and are still in working order, without complaint from either the Company or the Consumer.

THOMAS GLOVER thinks it necessary to put Gas Companies on their guard against parties selling Patent Dry Gas-Meters constructed in imitation of his, but unskilfully made on erroneous principles, and with improper and unsuitable materials.

THOMAS GLOVER'S Workshops are now the most extensive in this or any other Country, and he is thereby enabled promptly to execute orders to any extent required. Purchasers may at any time inspect his Works and the Materials of which his Meters are constructed. He is ready to enter into Contracts with Gas Companies and others to uphold their Stock of his Meters for Twenty Years at an annual charge varying from 2½ to 5 per cent., and to leave always in the hands of Gas Companies Three Years' charge for upholding, as a guarantee for the fulfilment of the Contract.

CROSLEY & GOLDSMITH'S

PATENT SELF-ADJUSTING & COMPENSATING GAS-METERS

CANNOT BE OVER OR UNDERCHARGED WITH WATER,

and they consequently register the quantity of Gas consumed with greater accuracy than Meters in which the Water-Line is variable.

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N.B. The Patent Self-Adjusting and Compensating Apparatus may be applied to the ordinary Meter.

Manufacturers of LOWE'S PATENT MOTIVE-POWER METER, for situations where there is an inadequacy of pressure to supply the special requirements of certain consumers in low grounds during the day or night.

Also, Manufacturers of EXPERIMENT METERS, GASHOLDERS, GOVERNORS, MINUTE-CLOCKS, PHOTOMETERS, &c. &c., similar to those used by Mr. King, of Liverpool.

EXTRACT FROM THE REPORT OF MESSRS. LOWE, KIRKHAM, PEARSE, AND BARLOW, ON CROSLEY AND GOLDSMITH'S PATENT METERS.

Our experiments lead us to the conclusion that the patent meter is a practical and substantial improvement upon the ordinary wet gas-meter, inasmuch as the capacity of the measuring chamber is not diminished by an excessive supply of water, nor can it be increased by drawing off water. On the one hand, therefore, the consumer is protected against any intentional or negligent overfilling of the meter, the result of which is to exaggerate the registered quantity of gas actually consumed; and, on the other hand, the gas manufacturer is protected against the fraudulent abstraction of water by the consumer, the effect of which in the ordinary meter is to cause it to register less gas than is really supplied. Time alone can determine whether these advantages are gained at the expense of its durability, or by any complexity which may render its utility doubtful; but, so far as we are able to form an opinion upon these points, the patent meters are not liable to any greater derangement than the ordinary wet meters, nor do we believe they will be less durable. (Signed) GEORGE LOWE, *C.E., F.R.S., Engineer-in-Chief to the Chartered Gas Company.*
JOHN KIRKHAM, *C.E., late Engineer-in-Chief of the Imperial Gaslight Company.*
GEDDIE PEARSE, *late Engineer-in-Chief to the Incorporated and Provincial British Gaslight Companies.*
THOMAS G. BARLOW, *Civil and Consulting Gas Engineer.*

LICENCES GRANTED TO THE TRADE ON MODERATE TERMS.

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NOTICES.

The subscription is 15s. per annum, if paid in advance during the month of January, or 18s. credit, in two sums of 9s. each, in July and January of each year. Post-Office orders must be made payable at the Charing-Cross Money-Order Office, to William H. Bennett, No. 42, Parliament Street, Westminster.

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THE JOURNAL OF GAS LIGHTING, WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, JULY 19, 1859.

NOTES UPON PASSING EVENTS.

PERHAPS the most serious problem before the public at the present day, in matters connected at least with the sanitary arrangements of our towns, is the devising of some means of preventing the pollution of the watercourses which has made itself so painfully evident during the extraordinary hot weather and the droughts of this spring and summer. Dr. Letheby and the official alarmists have, for once, been within the mark in describing the state of the Thames; it is, indeed, dreadful, and unless speedily dealt with in some efficacious manner it must give rise to some pestilence—provided always that we dwellers on this Mulebolge do not "become used to it"—a happy condition the Thames eels have not, however, been able to attain. The matter is too sad for joking though, and we therefore protest against Dr. Letheby's bringing forward the ridiculous letters and schemes of his correspondents, which we believe he could only have done as a piece of practical fun. Let our readers think for an instant of the jocular power it must have required coolly to have repeated M. Bourbée's scheme for lining the bed of the Thames with concrete! How the Doctor must have laughed in his sleeve when he found that this solemn farce was considered worthy of notice, and even of being referred to the Metropolitan Board of Works! and with what increased conviction in the power of scientific humbug must he have forwarded the letter from his French geological friend to the benighted Metropolitan Board, which of late seems to have somewhat neglected the Doctor himself and his warnings.

Great names and bold assertions, however, unfortunately enable many very absurd schemes to pass unchallenged; and sometimes, from the very fact of their being unchallenged, the schemes themselves take hold of the public. At the present day, moreover, there is rather a mania for laying down concrete beds to our watercourses; so it may be desirable, even at the risk of "crushing a fly on the wheel," to observe that no possible "mixture of lime and pebbles," as M. Bourbée calls concrete, would be able to resist the tidal scour of the Thames. Dr. Letheby must, or ought to, have known this; and he ought also by this time to know that the foul state of the River (which is rather worse at high water than it is at low water) does not so much depend upon the nature of the soil of its bed, as it does upon the materials which are being constantly thrown into it. *M. Bourbée s'est embourbé*—the French geologist, in fact, made a stupid suggestion because he is not an Engineer, and because he knows nothing of the hydrographical conditions of the Thames, or of the sewerage of London. His friend, Dr. Letheby, under these circumstances should not have paraded the letter which made manifest the ignorance of the man who confided in him; and the motives of Dr. Letheby's conduct in this case must ever, to those who have lately been behind the scenes, be open to suspicion or severe comment. It would indeed seem that the Doctor is vexed to find Mr. Millar employed by the Metropolitan Board of Works instead of himself, and he has thus seized every opportunity of thrusting his own name into the discussion about the stinking River.

But the state of the River is such that all these petty jealousies ought to be swept aside. Day by day as the heat continues, and the quantity of fresh water coming down from the uplands diminishes, does the Thames become fouler and more pestilential. It must not be forgotten that the whole character of the Engineering operations effected in this valley of late years has been of a nature to magnify the action of the natural causes which tend to make the river waters so repulsive. The remarkable extent to which land or farm drainage has been carried in the valley of the Thames has, in the first place, enabled the winter rains to flow off more rapidly than they used to do; and thus the very improvement in the surface agricultural conditions of the district has materially affected the supply of water to the main stream in summer. It may be that the more perfect drainage of the upper strata has to some extent interfered with the meteorological phenomena of our islands, by diminishing the summer supplies for evaporation; but this is at least certain, that during the last two or three years there has been a very deficient rainfall, and though the torrential rains which accompanied the late thunder-storms may, in a meteorological register, help to swell the recorded average fall, they have run off from the ground so rapidly that they have produced little effect on the flow of the River. An inspection of the overflow at Teddington Lock would, indeed, be sufficient to explain much of the evil we are now labouring under; and it must be borne in mind that the operations of the Water-Works Companies, which derive their supplies from above this point, are likely still further to diminish the actually insufficient flow of fresh water in the tidal part of the Thames; for in proportion to the continuance of the drought, and the present elevated temperature, will the consumption of water increase, until at last London may find itself in the position which Dublin is said to be—viz., positively short of water. Be this as it may, the inhabitants of London are now suffering the consequences of the improvident haste with which the connexion between the house drainage and the Thames has been enforced by the meddling *doctrinaire* sanitary Reformers. The organic impurities thus cast into the stream, instead of meeting there the fresh water necessary to destroy their prejudicial influence, meet at once with the brackish tidal waters which increase the evil complained of. As to the remedies now being applied—the tons of lime thrown down here and there—they are about of as much use as Dame Partington's mop and pail were to keep out the Atlantic. We must wait with what patience we may the completion of the intercepting sewers: we must urge on the sleepy Board of Words under the guidance of King Thwaites to greater activity; and we must insists upon the disinfection of all the sewerage hereafter to be thrown into the River.

It is unfortunate that Sir M. Peto had not learnt his lesson better on the occasion of making the motion for certain returns from the Board of Works; for he was quite right in asserting that that body had neglected to exercise proper energy in the discharge of its duty, and that its officers had displayed a sad deficiency of forethought and of scientific knowledge. The deficiency of the land waters of the upper Thames has been known for a very long time, and indeed attention had been called to the fact as early as April last; but it was not until the end of May, or the beginning of June, that the authorities under King Log began to apply their

partial remedies. There is, then, a necessity for instilling greater energy into the Metropolitan Board, but it may be questioned whether that object is to be attained by making it simply publish certain returns; still a temperate statement of the errors of omission and commission by that body would at least have convinced it that its proceedings were being scanned by competent parties. Sir M. Peto unfortunately made so many mistakes in his speech, and in the statements upon which he based the demand for the returns he asked for, that he only furnished an opportunity to Mr. Tite to quote a long array of statistics, which appeared to prove the great doings of the men he undertook to defend. It is very sad thus to witness the waste of time and attention of men able really to do good in the matter they together have for the present only embroiled; and if we might venture a suggestion, it would be to the effect that all the Metropolitan Members should collectively place themselves in communication, both direct and permanent, with the Board of Works. Possibly in such a case there would be a more intimate contact between the Board and its ultimate constituents (for it is a farce now to call it a Representative body); and thus a more pressing sense of its responsibility would be felt by the Board, and would give rise to a more earnest and energetic course of action than has hitherto prevailed in that body.

If, however, the so-styled local Self-Government of London has thus subsided into a species of "*fainéant*" state, it would seem that the *doctrinaire* administrative reformers are not disposed to imitate it; and that they are as anxious to destroy the liberties of the subject as ever. Sir G. Lewis is urging on the Corporation Reform Bill with indecent haste, and Lord J. Russell, one of the members for the City, is assisting to destroy the rights of many of his own constituents. The President of the Poor Law Board is endeavouring to smuggle through the House the disgraceful measure, by which it is sought to tax the ratepayers of some City parishes, retrospectively, (in order to cover the errors of the Poor Law Auditors,) under cover of a general and apparently innocent measure. Mr. Cowper, too, who was so long connected with those outrages on taste, yclept the Kensington Boilers, now feels an amount of æsthetic indignation against the advertising pillars, which is sufficient to induce him to bring all the weight of the Imperial Legislature to check the abuses of parochial authority. Where is all this to stop? The advertising pillars are certainly not beautiful, and their erection, in the positions hitherto chosen, has certainly not been judicious; but surely the parishes ought to know their own business better than a chance collection of county Members. And as a matter of taste it seems to us that the men who tolerate the statue of the Duke of Wellington opposite to Apsley House, or who admire the meretricious vampire lately stuck up by Marochetti in the gardens of that residence, should be "a little blind" to the defects of the gilt-gingerbread style of the advertising pillars. Such errors must, however, occur if the Government interfere in the details of municipal arrangements; and we hope that even Mr. Leslie will learn, from the threatened interference with his parish, somewhat of the blessings he would be likely to enjoy under a paternal Administration.

Whilst the inhabitants of London are suffering from the effects of the contamination of their "silent highway" by the pouring into it of the sewerage of their immense town, it seems that even remote country districts are exposed to the same evil, though fortunately for them some kind of legal remedy seems to exist in their cases. Thus it appears that the Magistrates of Essex have lately recovered a verdict against the proprietor of some cottages erected near the Lunatic Asylum of Chelmsford, because he had sunk a cesspool to receive the drainage of those cottages, in such a position as to affect the waters of the well of the Asylum. The principle involved in this case may have a very wide application; for there are many cities in England wherein the sewerage, as we very incorrectly apply the term at the present day, or rather the removal of house drainage, is effected by means of absorbing, or dead wells. If in such cases the waters of any existing wells should be injured by the construction of new cesspools, it would seem to follow, from the decision in the case we refer to, that the proprietors of the wells would have ground of action against the sinkers of the cesspools; and thus compulsorily the towns referred to would be compelled to execute a system of sewers. At every turn, then, this great question of the disposal of town refuse meets us; and most urgently does it clamour for solution.

At Dover and at Folkestone alike, we learn that the supply of water has of late been so materially diminished that the constant supply system has been forcedly limited to twelve hours per day; and in the case of Newmarket we hear that the supply is so short that the local authorities have been compelled to limit the watering of the roads. These tales ought to have a moral at the present day when schemes for obtaining water from the higher districts of the chalk are rather rife; and perhaps they may have had some influence with the Committee of the House of Commons when it decided that the preamble of the Maidstone Water-Works Bill was not proved. At any rate, they prove that the supply from the chalk formation is a limited one; and that the continuance of long periods of drought is sure to affect the water-works which depend upon it, unless they are situated immediately upon the outflow of a large back country. There are so many interesting questions, both theoretical and practical, connected with the water-bearing properties of the chalk formation that we propose shortly to treat them in a separate article.

Very little seems to be doing in other parts of the country to extend the benefits of a copious supply of water; for we only hear of the recent opening of the works at Lowestoft, and of the successful completion of the well at Bury Cross, for the Gosport Water-Works Company. The latter well presents a certain amount of geological interest from the fact of its being one of the first attempts made, in the particular locality, to secure a supply of water from the basement beds of the Hampshire tertiary series, which had already been tried, successfully, at Southampton, and (we believe) at Portsmouth. The Bury Cross well is 333 feet deep, and at present the water rises to within 9 feet of the surface, or about 15 or 16 feet above the mean sea level. It is supposed that as much as from 2,500,000 to 3,000,000 gallons of water can be pumped per day from this well; but we confess that we should expect that any such demand upon the sand-beds of this basin would rapidly affect the water-level in it. Under London the tertiary sands are nearly exhausted; and in some cases, which have come under our own personal knowledge, the wells sunk into them, and even into the chalk beneath them to a great depth, have been abandoned; whilst other wells situated near the river Thames are said to be affected by the brackish tidal waters. Hitherto there has been no consecutive pumping from the Hampshire tertiary sand-beds, on a large scale at least; and therefore it is to be hoped that careful observations will be made upon the working conditions of this Bury Cross well. It is fortunate that the management of this work is in the hands of Mr. Pilbrow; for no one is more able than he "to observe" in such cases.

From our own Colonies we have received a very long and ably written Report (always excepting the Americanisms, or the *blue nose* peculiarities of style, to be recognized from time to time) of the Commissioners for the Water Supply and Sewerage of St. John's, New Brunswick. It is satisfactory thus to find our descendants in another hemisphere vigorously addressing themselves to supplying the wants which, even according to the official Reports of the Prefect of the Seine, still press so heavily on the inhabitants of Paris, "the city which boasts of being the centre of civilization," but which actually has no high service of water to its houses. But there are two other things which strike us about the Report of the St. John's Water-Works; the first is, that the skill of the American Engineers does not seem to correspond with the public spirit of the people; the second is, that in our own Colonial possessions the customs laws seem designed to throw difficulties in the way of executing sanitary works. Indeed the tales told by the Commissioners of St. John's with respect to the cost of the works at Quebec, Montreal, Boston, &c., would lead to the inference that very serious blunders must have been committed ere the expenses could have attained such preposterous limits; whilst the heavy tax levied upon the importation of cast-iron pipes into New Brunswick proves that the local Legislatures have still much to learn with respect to the doctrines of political economy. However, the Report before us presents so many objects of interest that we gladly turn aside from these more unpleasant sources of reflection; and amongst other practical matters we would call the attention of Water-Works Engineers to the precautions described in the report as being adopted to resist the effects of frost during the long and severe winters of the peculiar climate of New Brunswick; and to the regulations for the prevention of waste. It

may be worth while to add that in laying the large 24-inch mains, used in this case of St. John's, wood wedges have been, with apparent success, applied in forming the spiggot and faucet joints instead of the usual gasket and lead packing. We should like to know how this system answers permanently; for if it should happen to succeed in New Brunswick, there can be no reason for not using it here. We suspect, however, that unless the pipes are carefully protected against the effects of frost, the wooden joints would be liable to numerous accidents; and evidently such a system of jointing must be utterly inapplicable to gas mains, for the tightness of the wedges depends entirely on their being kept constantly saturated with water.

In Australia, also, the restless Anglo-Norman race appears to be disposed to enter upon the great task of improving the hydrographical conditions of the Rivers of the interior; just as the Madras Irrigation Company and the Indus Flotilla Company are about to labour in the same direction in our Indian possessions. The various technical and theoretical problems involved in both, or in all these cases, are of the highest importance, and we sincerely hope that they will be treated more philosophically than they have hitherto been in our own country; for the recent discussions about the Nene, and generally about the state of our tidal rivers in England, have been of a most unsatisfactory nature. The prosperity of the interior of Australia, however, must depend so seriously upon the manner in which the Murray, Darling, and Murrumbudgee, for instance, are treated; and the consequences of introducing a system of legislation with respect to the water privileges of that country which may be opposed to the permanent interests of the public, may be so serious; that we would earnestly recommend the local Legislatures and the Colonial authorities to direct their attention to the matter, before rights in the waters of the country can be acquired.

We add a short statistical note illustrating the advantages of an "enlightened paternal Government." It appears from the official returns of the movement of the population of St. Petersburg between 1852 and 1857, that the number of births in that town had been on the average 17,245; whilst the number of deaths had been also on the average 23,240 per annum. This is a startling fact, and it certainly argues little in favour of a system of government which dispenses the citizens from the duty of taking care of themselves. Alas! there would seem to be a great necessity for considering all these abstract questions of social organization, if the signs of the times are to be read in their usual spirit; for famines, and other evils, threaten parts of Europe at least. In our own islands, for instance, the potato crop is seriously affected; in Northern Italy, agricultural operations must lately have been suspended during the shock of war. The future is dark indeed; but provided liberty survive, no fear for the ultimate consequences need be entertained. As for peace, it seems to us worse than folly to count upon its continuance.

THE MAIDSTONE WATER-WORKS BILL.

A QUESTION was incidentally raised, and disposed of, by the Committee which decided the fate of the above-mentioned Bill, of a far more important constitutional and moral character than would be inferred from the amount of attention paid to it at the time of its discussion. It appears that originally two schemes for supplying the town of Maidstone with water were submitted to the House of Lords, and that the Select Committee of that noble House decided in favour of the one which, in the course of last week, was not able to pass the ordeal of a Select Committee of the House of Commons. In the course of the inquiry before the latter tribunal, the opponents of the Bill endeavoured to show that the scheme submitted to the Legislature was not the best scheme for the supply of the town; and thereupon arose the question to which we refer, as to whether evidence could be tendered, in the course of such an investigation, for the avowed purpose of proving that a scheme for which Parliamentary powers were sought was, or was not, the best scheme for the interests of the public at large. The Committee decided that no alternative scheme was presented, and under those circumstances it limited the inquiry to the merits of the one immediately before it.

Now, we wish distinctly to state that we have no intention of passing an opinion on either of the Maidstone water schemes, but, on the contrary, we are anxious to record at once our conviction that, at either place hitherto suggested as the source of supply, the water could be met with, though it may be under very different conditions under the Lidsing-Well project than appeared upon the deposited plans. But the question we desire to have discussed is this—viz., whether it be, or be not, competent for a Parliamentary tribunal to examine into the relative merits of the schemes suggested for the purposes it is called upon to legislate about. If the application to Parliament be of any importance at all, it must, we believe, be because some extraordinary powers are thus to be obtained; and therefore it behoves both the Members of Parliament and the public to inquire into the nature and extent of those powers, and into the reasons for granting them.

In fact, an Act of Parliament incorporating a public company either means nothing at all, or it confers upon the Company statutory powers which remove the latter from the general scope of the common law, either in the matter of recovering its rates, in obtaining possession of property, or in obviating the consequences of its interference with other private rights. Practically the Act creates a monopoly, and a monopoly, it is to be observed, of a more permanent character than formerly existed, in consequence of the legislation of late years; so that the real bearings of the inquiry assume a far wider range than would at first sight be suspected. The establishment of a Water Company under Parliamentary powers in any particular place, almost entirely precludes the establishment of a second enterprise of the same nature, especially when the town to be supplied is, comparatively speaking, a small one; and we do hold that the powers so sought should not be granted until the necessity for conferring them had been proved, nor until it was proved that the scheme they were destined to advance was the best and most irreproachable one which could be suggested. It seems to us that by merely confining its attention to the matter immediately before it, a Parliamentary Committee ignores a great portion of its legitimate functions, which really are to advise the House of Commons or Lords, as the case may be, as to the advisability of placing any undertaking in an exceptional position. If several Companies could be established for the definite purpose, it might be a matter of indifference to the Legislature as to the extent to which the principle of competition might be carried, and the reckless waste of capital promoted by the late Sir R. Peel in the case of our Railway system might be repeated in other instances. But we repeat that in the case of a Bill for conferring statutory powers to erect the water-works of a small town such competition is utterly impossible; and that the first Company established will always be able to exclude a rival. If, then, the decision above mentioned of the Committee on the Maidstone Water Bill be in accordance with the precedents of Parliamentary practice, it seems to us equally unjust and unconstitutional; and we beg at once to record *(quantum valeat)* our protest against its recognition.

Circular to Gas Companies.

BEING anxious to lay before our readers the earliest information respecting the progress of legislation affecting the interests of gas companies, we published in our last number copies of the Sale of Gas Bill as proposed to be amended by the gas companies, and the Metropolis Gas Regulation as prepared by the delegates of the metropolitan parishes. Both these measures have since undergone considerable alterations, and we now present them in their amended form in another part of our JOURNAL.

Lord Redesdale's Sale of Gas Bill was read a second time in the House of Lords on the 11th inst., and it passed through a committee of the whole House on the following day. As amended, on being reported, the bill assumes a shape very different from the one originally proposed, though the machinery by which it is to be carried into operation is retained. Several of the suggestions of the gas companies have been adopted, and other provisions have been added to give greater precision to the bill, by which it has been materially improved, though it still retains defects that ought to be remedied before the measure receives the royal assent. A large portion of the clauses relate to the making and verifying of the standard measures for gas under the direction of the Lords Commissioners of the Treasury, and to providing copies of such standard instruments in different parts of the kingdom. The latter portion of the work is to be entrusted to the quarter sessions in England, to meetings of the justices in Scotland, and to the grand juries in Ireland, which bodies are empowered also to appoint inspectors of meters; the cost of providing the

copies of the standard measure and the payment of the salaries of the inspectors to be defrayed from the county rates. It is very properly provided, by a clause introduced into the amended bill, that any maker or seller of meters, or person in the service of any gas company, shall not be qualified to be appointed an inspector, though the clause is not sufficiently specific to prevent any one, after his appointment, from being so engaged.

The provisions of the thirteenth and fourteenth clauses, in which the required accuracy of meters and the mode of testing them are specified, are those on which the efficacy of the proposed measure principally depends. According to those provisions no meter is to receive the impression of the inspector's approving stamp which "shall be found to be capable of being made to register quantities varying more than two per centum from the true standard measure of gas by any contrivance moveable externally, or by decrease or increase of the water in such meter, or by any other means practically prevented in good meters." The operation of testing is to be first directed to ascertain the soundness or leakage of the instruments before the test for per centage of error is applied; and in determining accuracy of their registration it is directed that they shall be subjected to a pressure of five-tenths of an inch, and the "water used in such testing, and the air of the room in which such testing shall be made, shall be as nearly as practicable of the same temperature as the gas or air passed through the meter." The importance of maintaining equality of temperature in the water, the atmosphere, and in the gas, we have previously enforced, as essential to a correct measurement of the quantity passed through the meter, and we are glad that our suggestion to that effect has been adopted. Another suggestion of ours, that the meters should be tested with atmospheric air instead of with gas, to diminish the error caused by condensation, has only been so far incorporated in the bill as to mention the employment of atmospheric air for that purpose, but leaving it optional with the inspector to use either gas or air. It is advisable that in the further progress of the measure the use of atmospheric air for measuring the quantity registered by the meters should be rendered imperative, as the condensation of vapour in gas may occasion a variation of 3 or 4 per cent.

There is little doubt that the Sale of Gas Bill will pass this session, and in that case the enactment that no meters shall be manufactured that are incorrect beyond a range of 4 per cent., either in their regular action or under any probable circumstances, will be fatal to the manufacture of the water-meters now most commonly used, and will make the adoption of compensating meters indipensably necessary. Of this kind there are several now competing for public favour, all of which, when properly regulated, maintain the true water-level with great constancy. Of these we may name the meters of Mr. Sanders, Messrs. Crosley and Goldsmith, Mr. Scholefield, Mr. Wright, Mr. Esson, and Mr. Allen. The great importance which this subject is now assuming may induce us in a subsequent number to describe their distinctive actions and to point out their respective merits.

Among the defects of the bill which will require to be remedied is the want of precision in the 19th clause, which, as at present worded, leaves it open to the meter manufacturer to fix the quantity of gas which any meter is *intended* to measure per hour, without limitation to the speed of the measuring drum. The rate of speed generally adopted by the best meter makers is 100 revolutions per hour, that being the greatest at which a regular action of the instrument can be maintained; but other manufacturers may adopt a speed of 150 or 200 revolutions an hour, so as to estimate a meter that is of only of sufficient size to register correctly 20 cubic feet an hour as capable of passing twice that quantity. This objection might be removed by substituting for "the quantity per hour it is intended to measure in cubic feet," the words, "the quantity measured by 100 revolutions or complete actions," that number of revolutions being considered the extent of the due performance of a meter in one hour.

A deputation waited on the President of the Board of Trade on Friday, in reference to the Sale of Gas Bill; and an influential petition in its favour has been presented to the House of Lords with the signatures of Mr. Robert Stephenson, M.P., Mr. Joseph Locke, M.P., Sir S. Morton Peto, M.P., Mr. Brunel, Mr. Fowler, Mr. C. H. Gregory, Mr. Scott Russell, Mr. Errington, Mr. Berkeley, Mr. M'Lean, Mr. Harrison, Mr. Hawkshaw, Mr. Joseph Cubitt, Mr. Page, Mr. Brassey, Mr. C. Manby, and many others of the *élite* of the engineering profession, also of Messrs. Maudslay, Sons, and Field, Messrs. Hitchcock and Co., Messrs. Shoolbred and Co., and the proprietors of many other extensive establishments, the managers of most of the metropolitan theatres, &c. &c. As the proposed measure will most probably pass through both Houses of Parliament in the course of a few weeks, no effort should be spared to remedy its defects and make it as perfect as possible, so that the much-vexed question of meters may be at length satisfactorily settled.

The Metropolitan Gas Regulation Bill has undergone more extensive changes than the bill for the regulation of meters. It has evidently been put into the hands of some one skilled in the art of cooking such documents for presentation to Parliament. The ridiculously inconsistent preamble has been reduced to a minimum quantity; the sections have been cut up and increased in number; and much of the surplusage has been omitted; so that the bill, as introduced by Sir John Shelley on the 7th instant, is shorter and is more practical in its appearance than the crude abortion of the delegates. In substance, however, the bill is the same, for though greatly altered in form, and somewhat in its machinery, its provisions remain without amendment. The preamble, as before, enumerates among the companies to be included within the operation of the measure several that supply only thinly-populated surburban districts, on whom the same regulations and price cannot reasonably be imposed that are fitting for those companies that supply the densely-populated parts of the metropolis. According to the bill as it now stands, a suburban company might be compelled, within three days, to lay down several hundred yards of service and other pipes without having a claim to more than one fortnight's supply of gas to the consumer who demands it; and as there is no provision for a minimum charge, the claim of the company for gas consumed might not amount to one shilling, as a compensation for the outlay. The impracticable provisions respecting the purity and pressure of the gas are retained, which would render such a measure inoperative; and the rent for meters above 100 lights has been reduced in the altered bill from 12½ to 10 per cent. on the cost price. The proposed meter-rents for the smaller sizes, which were omitted in the original bill, have been introduced. They are fixed at prices which would barely pay 5 per cent., taking into consideration the wear and tear, and the labour and expense of fixing; the proposed rent for a 2-light meter being only 2s. 6d. Many of the provisions relating to meters would be rendered nugatory by Lord Redesdale's bill, which presents a remarkable contrast in some respects to the attempts at legislation by the delegates. The latter, in their hot haste for reformation, regardless of the principles of justice, were for insisting that all meters at present used should be tested and stamped within six months; and if not found "incapable of being made to register falsely," should be condemned for evermore; but the Sale of Gas Bill pays more respect to vested interests, and allows ten years for the continued use of the meters already fixed. The extensive confiscation of property contemplated by the delegates has not, however, received the sanction of the skilled parliamentary agent who has remodelled their bill; and he has also removed from the shoulders of the Metropolitan Board of Works much of the labour and responsibility that would have been imposed on them by the delegates, whose peculiar sense of justice dictated to them the propriety of giving to these nominees of the gas consumers the power to appoint persons to examine into complaints against the companies who supply them, to inflict penalties against which there should be no appeal, to appoint auditors of accounts with a view to the reduction of the price of gas, and to direct the Attorney-General to institute proceedings against the companies. These propositions of the parochial delegates for the equitable regulation of the supply of gas to the metropolis may be taken as examples of their mode of dealing with the interests of the gas companies, and they have but little chance of being sanctioned by Parliament. The bill cannot, however, proceed further during the present session, unless the standing orders be suspended for that special purpose, as the usual notices required for a private bill have not been given; and it is not very likely that the House of Commons will so far depart from established precedent in favour of a measure that is manifestly unjust in principle, and would be impracticable in its operation.

Communicated Articles.

HYDROLOGICAL CHEMISTRY.*

At the present day, when hasty analysis and bold assertion are sufficient to establish the reputation of scientific men in our country, it may be of service to call attention, from time to time, to the works of scientific men in other lands, if it were only for the purpose of inducing the English public to examine into the validity of the claims of those who assume to be its guides. This remark is especially true with respect to the position and influence of the men who seek to lay down the law upon the subject of the chemistry of water required for the ordinary purposes of life, and who, unfortunately, possess official influence and public confidence in our own country. Indeed, the constant repetition of the dogmas held by the Registrar-General, and the medical authorities who support his views, is likely to produce so injurious an effect upon popular opinion, that it behoves all parties, who are in the position so to do, to allow no occasion to pass by without challenging their correctness. Under such circumstances, the publication of a distinct treatise upon the subject of hydraulogical chemistry, by a person entirely dispassionate and uninfluenced by the contending parties to the discussion so long maintained here, must of itself be a matter of curious interest; but the book it is now proposed to bring before the attention of our readers is worthy of notice on other grounds, and it will be found that the author has produced a treatise on a subject of great general interest which may be referred to with advantage by all lovers of philosophical truth, without seeking in it for arms to attack or defend any peculiar positions or opinions.

M. Lefort's book is, as he states in his preface, divided into four principal parts, which are preceded by an historical essay upon the science of hydrological chemistry, and some general considerations upon the analysis of water. This preliminary historical portion of the work appears to us to be rather deficient, insomuch as it contains no reference to the opinions held upon the subject of waters adapted for domestic use by such men as Hippocrates, Vitruvius, Pliny, Frontinus; or, later still, by Hallé, Tissot, Nyster, Rostan, or by the English school of chemists, who, by the way, seem to be very little known to the scientific men of the Continent. It is curious, however, to note how very recently it is that attention has been earnestly and systematically directed to a subject of such universal interest, and how very small was the amount of knowledge with respect to the composition and action of a fluid used at every moment, and under every imaginable condition of daily life, until within a very few years. Boyle was almost the first person who attempted (about 1686) an analysis of water; and it was not until about 1840 that anything like correct methods of analysis were applied generally, or on a large scale by the French chemists. As the man in Molière's play had written prose all his life without being aware of the extent of his own powers; so it was then found that mankind had been consuming, in perfect ignorance of its qualities, the fluid required for domestic use. The *Bourgeois gentilhomme*, no doubt, become more critical with his increase of knowledge, and perhaps would have been rendered uncomfortable by detecting errors in his own literary composition, of which he was previously unaware. At any rate, so soon as attention was called to the composition of water, and to the methods of analysis applicable to it, we know that a great deal of alarm was excited in the public mind with respect to the pathological effects of many of the waters, which had been previously used for centuries without producing any perceptibly bad results. Subsequent researches have dispelled much of the alarm created by the hasty generalizations of the first hydrological observers; and they have thrown additional light upon the action of certain waters in developing particular forms of disease. In M. Lefort's book some of the events of this history may be traced, but the history itself is still to be written; and we know few subjects of greater scientific interest than might be found in the record of the development of the science of hydrological chemistry, and of the opinions popularly entertained with respect to it.

After the rapid and (to us) unsatisfactory sketch of the history of this branch of chemistry, M. Lefort describes the preliminary notions upon the states in which water exists; the general divisions of water, in the liquid state, into soft or mineral; and he then enumerates the simple bodies, and the salts resulting from their combinations, which are to be found in those bodies. This portion of the work is disposed of in a very few pages, and then our author proceeds to examine, in the first part of the main body of his Treatise, the various conditions under which soft waters occur in nature; and after indicating their physical properties, he devotes a chapter specially to an inquiry into their economical properties, for private consumption, domestic economy, and industrial purposes. It is this portion of the Treatise which strikes us as being the most generally and practically useful, and we therefore propose to dwell the most upon it; but the other parts of M. Lefort's book present objects of inquiry which may appear to others to be of at least equal value to the one we prefer. For instance, the second part treats of the physical properties, the temperature, and composition of mineral waters; the third part treats of the elements of both soft and mineral waters, and discusses the opinions usually held upon the nature and origin of those elements; and the fourth part is devoted to the consideration of the methods of quantitative and qualitative analysis of soft, mineral, and sea waters, and of their separate elements.

Amongst the remarks made by M. Lefort upon the properties of water in the liquid state, it seems to us that the incidental allusions he makes to the composition of the vapour of fogs would merit greater development than the subject has yet received. In fact, the vapour thus rendered visible would, in all probability, be charged in a distinct manner with the gaseous exhalations of the soils over which they float; and therefore, in all probability, an examination of their composition would be likely to elucidate the causes of the hygienic effects of those vapours. It is supposed, indeed, that the vapours rising from marshes, or stagnant waters, take up from the latter some of the principles which are there in process of decomposition, and that the winds carry them to considerable distances. Medical men have often asserted that the miasmas arising from such places are the causes of the fevers and agues prevailing around them; and there can be no reason to question the correctness of the opinion. But it certainly would be more satisfactory were the active morbific principle of such marsh vapours ascertained, because the knowledge of the nature of the evil might furnish valuable indications of the nature of the remedy to be applied. M. Boussingault has made some experiments (very incorrectly recorded at p. 12 of M. Lefort's book), from which it would appear that the quantity of ammonia contained in fog vapours varies from day to day within a very wide range. These experiments, however, may be suspected to have been made near Paris, and they therefore require to be repeated elsewhere; and attention should be paid to the other elements besides the ammonia with which that agent is in connexion. M. Boussingault found, it would appear, on some occasions that a litre of water obtained from a fog yielded from 3 to 9 milligrammes of ammonia (0·000,003 to 0·000,009 in weight), whilst fogs remarkable for their smell and their duration yielded as much as from 50 to 138 milligrammes (0·000,05 to 0·000,130); and the same observer also found that thick fogs were highly charged with nitric acid, for he found on one occasion as much as 10·11 milligrammes of nitric acid in a litre of water collected in Paris from such a fog. Would not investigations of this description, carried on in London and in Amsterdam, throw a curious light upon the origin of some of the epidemic and endemic diseases, which evidently have a local origin in those districts? The peculiar smell of these fogs must be connected with the elements they contain, and most probably in a manner likely to be injurious to the health of the populations exposed to them. These remarks, it is to be observed, will apply equally to the composition of dews and other forms of condensed vapours.

The composition of rain-waters has been more carefully studied than that of the vapours constituting fogs, and it is now ascertained without doubt that rain-waters contain, though in much smaller proportions, the same mineral principles which are to be found in spring or river waters. The rain which falls near the sea-shore invariably contains chloride of sodium: iodine, according to M. Chatin, is constantly present in rain, whilst other observers have discovered in variable proportions bromine, hydro-sulphuric acid, and various other salts and alkalis. The first drops of a shower, also, carry down the organic matter floating about in the atmosphere in a highly attenuated form, and it is to this fact that the peculiar odour of the water of rain-tanks or cisterns in hot weather may be attributed. M. Barrat has carried on one of the most consecutive series of observations on the composition of rain—that is to say, of the observations quoted by M. Lefort—and from them it would appear that a mètre cube of water, collected in Paris during the months of July to December, 1851, contained, according to the height at which it was collected, as follows:—

Substances.	Terrace of Observatory. Grains.	Court of Observatory. Grains.
Nitrogen, per mètre cube	6·397	7·939
Ammonia "	3·334	2·769
Nitric acid "	14·069	21·800
Chlorine "	2·801	1·946
Lime "	6·220	5·397
Magnesia "	2·100	2·300
	34·921	42·151

The proportional quantities of these various substances are, no doubt, very small, but they prove that it is not to the chemical reaction of the ground alone that we ought to attribute the presence of the nitrates which are so commonly found in the waters of shallow wells and springs. Perhaps also it would be right to infer from these and from analagous observations subsequently recorded in M. Lefort's Treatise, that there would be a probability of meeting with an objectionable quantity of the same nitrates in waters obtained by collecting the rain-flow; and therefore we would suggest, to those who are in a position to investigate this important and delicate subject, that it would be desirable to pursue a series of experiments upon the qualities of the waters obtained from the most important gathering grounds. If the rain-waters collected at Paris be sensibly affected by the winds blowing from the sea, and during their prevalence be highly charged with the chloride of

* "*Traité de Chimie Hydrologique.*" Par J. Lefort. 8vo.: Masson, Paris, 1859.

sodium, there must be a much larger proportion present in the rain-waters collected by the Liverpool and Manchester gathering grounds; and it may also be suspected that a careful analysis of the waters of Loch Katrine itself would disclose in them the existtence of many of the elements found in the rain-water of Paris.

M. Lefort states briefly the circumstances which are likely to affect the composition and the action of spring or of ordinary and Artesian wells. There is little novelty in this portion of his essay, but he incidentally alludes to a fact which may require further investigation. It is to the effect that the waters of Artesian wells of considerable depths are characterized by a deficiency of aeration and an absence of free nitrogen and oxygen, and that they are, consequently, more indigestible than ordinary spring or river waters. This may be true of the deep Artesian well of Grenelle, but we are not aware that hitherto any observations have been made on the composition of other Artesian waters to justify the assertion of any general law on the subject of their wholesomeness. As so many localities at the present day have resorted to sources of water supply of this particular kind, it would be advisable to make a consecutive series of observations upon their results.

The waters obtained by the collection of the rainfall in cisterns or in ponds, evidently must be affected by the impurities they are likely to come in contact with either in falling or subsequently to their storage. It is to be regretted that so little attention should be paid to the discovery of the most efficacious methods of remedying ing the evils attached to this description of water supply, for it is compulsorily the only one which can be adopted in many very large districts; and neither in M. Lefort's Treatise, nor in any other work that we are acquainted with, have we seen any simple rules for the treatment of these storage waters. Filtration through animal charcoal will, no doubt, remove most of the suspended organic matters, and perhaps also some of those which are in solution; but the process is slow and costly, and, after all, it leaves a vapid, unpleasant water. The poorer people, in districts which are thus supplied, rarely take any precautions about filtration, and they use the cistern or pond water in the state it may happen to be in at the moment they require it. Fevers, agues, and dysenteries are consequently amongst the permanent scourges of these populations, and, to a much more serious extent, of the strangers who may visit them. These remarks may be extended to the waters obtained from canals, as in the case of the principal supply of Paris itself, for they must participate in the nature of stagnant and impure waters; and as such they ought, we believe, to be resorted to as a source of town supply only at the very last extremity. M. Lefort even says that the waters of great lakes are almost always characterized by the presence of, comparatively speaking, large quantities of organic matter; and if this be the case, *à fortiori*, the artificial lakes created for the purpose of storing the waters from gathering grounds must be still more objectionable, for the same reason—viz., on account of their possible contamination.

Indeed, the result of the investigations of the foreign chemists appears decidedly to lead to the conclusion that under normal conditions the most desirable source of a town water supply is to be found in large rivers which have already flowed for a considerable distance, but are not yet exposed to the influence of the tidal wave, or rather to the intermixture of sea-water. M. Lefort states distinctly that so far is it from being true that "the nearer the source, the purer the water," that, on the contrary, the first feeders of rivers are more highly charged with the earthy salts and the minute particles detached from the formations which furnish their supply, and that consequently river waters gain by exposure to the air, and by a prolonged course above the ground. Of course this rule must only be applied in cases wherein the rivers run over beds which are not of a nature to communicate additional elements of impurity, and wherein the stream flows with sufficient rapidity to carry forward the mud, and decomposing vegetable and animal matter, from whatever source they may be derived; and M. Lefort very properly calls attention to the difficulty with which river waters, containing much fine mud, are freed from it. It is on this account that it is necessary to filter very carefully the river waters derived, for the purposes of town supply, from the lower portions of an extensive hydrographical basin; and it may be added that it is also to the difficulty, if not to the utter impossibility, of separating the finer mechanical impurities of such streams, that the inhabitants of London may attribute the peculiar opaline colour of the water distributed to them after a continuance of heavy rains. Be this as it may, the law M. Lefort appears to be most inclined to assert as a guide in the selection of a source of water supply would be, that "running waters, taken in mid stream, and at places removed from the influence of great centres of population, are, between the respective periods of the summer droughts and the winter floods, the most adapted for the different economical and industrial operations, and the personal consumption of human beings." If, he adds, these waters do not possess the freshness of spring waters, they are nevertheless more perfectly aerated; and he also observes that the bicarbonate of lime, which is the most common mineral ingredient of river waters, is considered by the majority of those who have studied these questions, to be rather advantageous than otherwise, in a hygienic point of view. And thus it would seem that the doctrines of the late General Board of Health, with respect to sources of water supply, and with respect to the superiority of soft waters to those owing their hardness to the presence of the bicarbonate of lime, are in decided opposition to those of the most competent authorities of other countries.

These opinions of the continental authors on hydrological chemistry are, in fact, based upon a principle which has either escaped the attention of our official authorities, or has not obtained from them the consideration it merits. M. Lefort, indeed, states that perfectly pure water does not exist in nature, and therefore we infer that when it is pretended that the Loch Katrine waters are perfectly pure, the assertion is to be received "with a reservation." He then adds that the part which drinking water plays in the economy of the human frame is not limited solely to serving as a vehicle to the food, but that the gases and the mineral substances the water may contain materially assist or influence the phenomena of digestion and alimentation. The substances necessary for these purposes are lime, silica, and phosphoric acid, required for the supply of the osseous system; the alkalis, required for the blood; and the oxygen, required for the respiratory system. "An ordinary water, deprived, or nearly so, of saline matters, is not more digestible than distilled waters, even when aerated. *There is, therefore, no relation between the purity and the quality of a water.*" We commend this last sentence especially to the notice of the Registrar-General and of Dr. R. D. Thomson—and to the public.

The proportions of foreign matters, considered by the French chemists to be admissible in a good potable water, are about 0·0006 in weight of earthy or saline matters, and 0·00001 of organic matters. The sulphate of lime is the salt which they consider to be the most injurious; but the salts of magnesia are stated by some eminent authorities to exercise a great influence in developing the hideous disease known under the name of *Goître*. Where either of these salts exist in notable quantities, the waters containing them must not be resorted to for the supply of water for domestic purposes. From the special observations of M. Dupasquier (of Lyon), it would appear that waters containing a moderate proportion of the bicarbonate of lime are the most adapted for industrial and agricultural operations, just as we have seen them to be the most fitted for human consumption.

The other portions of M. Lefort's book treating of the mineral waters and modes of hydrological analysis will be noticed on a future occasion.

Correspondence.

THE GAS STOKERS' APPEAL.

SIR,—In all the various processes recently invented by skilful gas engineers, there has not been as yet any attempt made to ease the labour attached to their improvements. When any alteration takes place, it is not to the advantage of the laborious stokers, firemen, coke-hole men, &c., &c., but quite the reverse, adding more labour, and requiring more attention to the heats, besides other sundry difficulties to overcome.

Those men of hardship and excruciating heat are getting more enlightened in their sphere of life, and are all united to persevere in becoming an honourable, useful, and meritorious body of individuals.

They are only at the present moment on an equal footing with those employed outside of the gates that enclose the men of fire.

Outside men work only ten hours per diem for five days, and leave off on Saturdays at four o'clock p.m., making eight hours.

The poor inside workmen are obliged to work hard twelve hours per diem for seven days, making their earnings the same as a common bricklayer's labourer, 4d. per hour. Is this a sufficiency to sustain life with such nourishment as is requisite to uphold the inward man, to enable him to undergo such a laborious occupation, more especially at this present trying moment? besides which, most of them have large families to support.

Those men ought to be more appreciated and put on an equality with the bricklayers themselves, and receive their 5s. per day, for in the absence of the mechanic, anything wrong transpiring, they generally unite together, and repair the damage in a workmanlike manner.

Those men of fire have unanimously petitioned their employers for a Sunday's holiday in every month, with pay for the same. Several of the gas companies have most generously complied with their men's humble solicitations—viz., the Chartered, Westminster station; City, at Dorset Street; &c., &c. Mr. Innes, of the Phœnix, Bankside, excels them all. Praise be to him! He grants the day gang two Sundays, and the night gang one Sunday a month, in their turns.

The gentlemen of the Imperial take it in a wrong light. Notwithstanding, every credit is due to the St. Pancras station officers for their benevolent donation, by giving all the seven-day men, of every description, an excursion to a country place of amusement, where there was no distinction shown between man and master—abundance of eatables, drinkables, plenty of sport, &c., &c. This, of course, is a relaxation from labour and incarceration; still, it is not the main point that the men wish to be adopted.

Those that have got wives and families most earnestly desire to have a Sunday once a month to enjoy their paternal and matrimonial domicile, without any interruption; and at the same time, according to their pleasure, may do honour to the Omnipotent, by

attending his house of prayer—man and wife, single men with their intendeds, exclusive of the other superfluities (the children). This they may do as they think proper.

We pray that every gas company may grant this holiday for the benefit of their men, and likewise solicit the chairmen and gentlemen of the committees of the various gas establishments to take it into their mature consideration, and benevolently grant an advance of wages to the men of fire.

A Stoker in a Metropolitan Gas-Work.

Register of New Patents.

2983.—Francis Puls, chemist, of Roxburgh Terrace, Haverstock Hill, London, for "*The treatment of hydro-carbons.*" Provisional protection only obtained. Dated Dec. 30, 1858.

This invention for the treatment of hydro-carbons has reference to the heavy oils and fatty matters, or solid and fluid hydro-carbons obtainable by distillation from gas-pitch, gas-tar, asphalte, coal, coal-tar, bituminous matters, and other such substances which do not contain oxygen, or not in sufficient quantity to be saponified with alkaline lees. To oxidize these hydro-carbons by means of acids or otherwise, and use them in this oxidized state, either alone or mixed with other fatty or oily substances, for the purpose of combining them with alkaline lees, is the object of this invention, and the combination so obtained is used as a lubricating material.

2987.—Thomas Bell, of Plaistow, Essex, for "*Improvements in purifying gas.*" Provisional protection only obtained. Dated Dec. 30, 1858.

For the purpose of purifying gas by this invention, a substance is employed which at the present time has but a very small or no commercial value—viz., the residuum resulting from the working of Longmaid's process for the manufacture of the sulphate of soda. This process consists in roasting common salt with iron pyrites, which results in the conversion of the soda into sulphate and of the iron into red oxide. Afterwards, the soda-salt is dissolved out, leaving a residuum, which is the substance here employed, and which is found to have like purifying properties to oxide of iron, of the form and purity at present used for purifying gas.

For the same purpose is employed the oxide of iron refuse obtained by burning iron pyrites in the manufacture of sulphuric acid; and this substance is in some cases prepared by grinding and washing, so as to obtain an impalpable powder, which, when dried, is ready for use.

By bringing hematite iron ores to a red heat, and afterwards grinding and washing them, they are reduced to a form in which they are suitable for use in the purification of gas. A substance suitable for the purification of gas may also be prepared by roasting copperas, either alone or with lime, magnesia, or alkali, together with coal or carbonaceous matter.

Either of the above ferruginous materials, after it has been used for the purification of gas and has become charged with sulphur, is, according to this invention, rendered fit to be again used for purifying gas by driving off the sulphur by heat, and this is either done by heating the substance in retorts, so as to distil off the sulphur, or by burning it off.

2960.—John Davis, of Liverpool, provision merchant, for "*An improved portable self gas-generating lamp.*" (A communication.) Patent dated Dec. 27, 1858.

This invention relates to improved hydro-carbon vapour burners, and consists in the employment of a heating or vaporizing tube and retort, charged with asbestos or any analagous material, and carbonaceous fluid, ormond oil, or other hydro-carbons, passing over the flame of a burner supplied with vapour generated within the tube or retort, into which fluid, ormond oil, or other hydro-carbons are charged by pressure.

It also consists in providing the tube and retort so charged with a cover or cap to retain the heat around its upper surface.

It also consists in an arrangement of the several parts, viz., the syphon-shaped vaporizing tube, the retort or chamber over the burner, with its charging material and cover, and conducting-tube and burner, and elevated reservoir and valve, so that the fluid, ormond oil, or other hydro-carbons from the reservoir, is applied to the heating part of the vaporizing tube by pressure, and the entire vaporization and burning of its material effected without residuum.

The chamber may be made of any form calculated to receive from the flame, it being necessary to the perfect vaporization of the fluid, ormond oil, or other hydro-carbons, that the heat should be nearly equal to that of redness.

The packing of asbestos or other analagous material in the tube is in order more perfectly to equalize the flow of the liquid, which is forced through the packing by heat or pressure from the fountain.

The claims are for—

1. The use of the heating and vaporizing tube charged with asbestos or other analagous material and fluid, substantially as hereinbefore described and for the purposes set forth.

2. Constructing the vaporizing tube and retort in such a manner as to convey the material over the flame of a burner substantially as described.

3. Combining the cap or heat-retainer with a vaporizing tube and retort or chamber as described, when so arranged over the flame as to operate in the manner set forth.

4. The combination of the heat-retainer and vaporizing tube charged substantially as described with the elevated reservoir, the whole arranged and operating with respect to the valve and burner substantially and in the manner hereinbefore set forth.

17.—James Harris, of Hanwell, Middlesex, Engineer, for "*Improvements in apparatus for regulating the pressure and flow of steam, water, and other fluids.*" Patent dated Jan. 1, 1859.

These improvements relate principally to apparatus for reducing high-pressure fluids to any given pressure below that in the boiler, water-main, gas-main, or any other main, or for allowing steam or other fluid when it has attained a given pressure to escape either into a second receiver or into the open air through a safety-valve or danger-signal, or otherwise.

To effect the reduction of high-pressure fluid to low pressure, a nozzle is formed with inner and outer chambers; the inner chamber is connected with the pipe leading from the boiler, or gas, or water, or other main containing the high-pressure fluid, and is termed the inlet, and the outer chamber is connected with the outlet. A double-seated or equilibrium-valve is made to communicate between the inner and outer chambers. Attached to the outer chamber is a small cylinder fitted with a piston, which has a flexible diaphragm on its inner surface to prevent leakage, the outer surface being open to the atmosphere. The inner side of the piston is connected with the said double-seated valve by a loose or ball joint; the double-seated valve is kept open by means of a spiral spring acting against the outer side of the piston, which forces it inwards, and the valve is instantly closed, or partly closed, by the fluid in the outer chamber when it has attained sufficient pressure to overcome the power of the spring. The spring may be so adjusted by a screw as to give any required pressure on the outlet side of the nozzle below the pressure in the inner chamber or inlet side. Weights may be substituted for springs for adjusting the pressure in the outlet-pipes, and a single valve or a lever and cock may be substituted for the double-seated valve.

For allowing steam or other fluid to escape when it has attained a given pressure either into a low-pressure boiler, or other receiver, or into the open air, the inlet is reversed and leads into the outer chamber, and the outlet is from the inner chamber. The double-seated valve is also in this case made to close by the force of the spring or weight, and is opened by the steam or other fluid increasing in pressure sufficiently to overcome the force of the spring or weight by which the valve is kept to its seat.

By attaching a piston fitted as above to either a small single or double-seated valve in connexion with a steam-whistle, it then becomes an almost frictionless danger signal for preventing explosions of steam-boilers, in which the spring, by means of the screw, may be adjusted to any desired pressure.

In some instances this alarm signal would be placed in a nozzle in combination with another whistle for signalizing a deficiency of water in the boiler, and which is put in operation by a float and lever.

A damper in connexion with a low-pressure boiler, into which boiler the low-pressure steam may escape by the improved valve from a high-pressure boiler (as in the case of a high-pressure whim-engine being placed near a condensing pumping-engine), is actuated by a piston and diaphragm as before described, is self-acting, and thereby subdues the fire and saves fuel.

In all cases where the improved valve, &c., are applied to steam-boilers, the piston and flexible diaphragm are placed in a chamber some inches below the passage, so as to be out of the way of the direct action of the steam, and where it is covered with condensed water; its durability being thereby considerably increased.

To prevent the condensing-engine banging or striking the spring beams or spring blocks, as the pressure in the boiler increases, by the admission of the surplus steam from the whim-engine boiler or other boiler, a small cylinder is employed, which is fitted with piston-valves, side passage, and adjusting-cock, to be used with either water or air; otherwise a cylindrical bellows, either of which may be actuated by the cross-head of the engine or by tappets. The rod of the piston in the small cylinder, or the rod secured to the cylindrical bellows, as the case may be, is connected with either the steam-valve, the regulating-valve, or the equilibrium-valve of the engine, or with all the valves, as occasion may require, by means of rods, cranks, and levers, so as to regulate the length of stroke without requiring the incessant attention of the engineer, under a varying pressure of steam in the boiler. This part of the apparatus is so constructed as by a connecting-rod, lever, and catches, to lock the hand-gear of the engine, in the event of the engine striking a heavier blow than usual on the spring beams, consequent on anything getting wrong with the pumps.

To regulate the speed of a crank-engine, an equilibrium or double-seated valve is employed, to which motion is given by an eccentric and links opening the valve twice at each revolution of the engine; the distance to which the valve shall open and the time of closing are regulated by the ordinary governor acting upon either sliding wedges, or by a quick motion screw and lever.

The claim is for the improvements in apparatus for regulating the pressure and flow of steam-water and other fluids hereinbefore described and illustrated in the drawings annexed to the specification.

55.—George Kennedy Geyelin, civil engineer, of London, for "*Regulating gas-burners, which he calls the 'Universal Gas-Burner Regulator.'*" Patent dated Jan. 7, 1859.

The difference between the ordinary gas-regulators with valves and this consists in the interposition between the valve and the burner of an inner perforated chamber, the hole of which will not pass more gas under low pressure than is necessary for the consumption of the various kinds of burners. To prevent the almost total stoppage of the supply of gas under very high pressure, when the valve is closed, the valve can be perforated or a hole made in the outer case.

The spherical valve, when lifted by the diaphragm over the inner chamber, closes against the cone, and this construction allows the regulator to act horizontally. This chamber is perforated, the number or size of holes varying according to the description of burners used. Thus, argand burners of thirty holes require more or larger holes than fishtail or batwing burners; but, should the burners be changed at any time, it is easy to stop up some of the holes with white lead or to enlarge them, according to requirement. The holes ought to be only sufficiently numerous or large to admit sufficient gas to the burner under low pressure. The moment the pressure increases the gas lifts the diaphragm of oiled silk over the inner chamber, which closes partially the valve. But to prevent the almost total stoppage of the supply of gas under very high pressure, when the valve is closed, it is perforated with a hole sufficiently large to supply the burner. From the inner chamber the gas passes into an outer chamber, where it expands previous to reaching the burners. Under the diaphragm is a bridge, which prevents the valve from sinking, or in some cases a support from below is obtained by means of a cone.

The claim is for regulating the supply of gas by means of the inner perforated chamber and the perforated valve; also the general construction of the regulator as described.

PROVISIONAL PROTECTION

HAS BEEN GRANTED FOR THE UNDERMENTIONED INVENTIONS.

1547.—WILLIAM WILKINSON, of Bayswater, in the co. of Middlesex, engineer, and DAVID WHITE, of High Holborn, in the same co., surveyor, for "*Improvements in apparatus for holding, regulating, compressing, and burning gas and other gaseous fluids, parts of which apply to the holding of liquids.*" June 29, 1859.

1549.—WILLIAM JOHN THOMPSON WILLIAMSON, of 37, Gerrard Street, Soho, Middlesex, for "*Improvements in gas-burners.*" June 29, 1859.

1551.—JOHN JOSEPH GRIFFIN, of 119 and 120, Bunhill Row, London, for "*Improvements in gas furnaces, suitable for fusing refractory metals.*" June 29, 1859.

1576.—WILLIAM EDWARD KENWORTHY, of Water Lane, Leeds, in the co. of York, agricultural chemist and shoddy merchant, for "*Improvements in purifying gas, and saving of lime in the said purifying.*" July 1, 1859.

1594.—WILLIAM KNAPTON, of Albion Foundry, Monkbar, in the city of York, and ADAM AITCHISON, of Knottingly, in the co. of York, for "*Improvements in the manufacture of gas.*" July 5, 1859.

1603.—JOSHUA HORTON, of Dudley, in the co. of Worcester, machinist, for "*A new or improved gas-meter.*" July 6, 1859.

NOTICES HAVE BEEN GIVEN OF INTENTION TO PROCEED WITH THE UNDERMENTIONED INVENTIONS.

653.—WILLIAM CLARK, of 53, Chancery Lane, London, engineer and patent agent, for "*Improvements in the apparatus of electric lamps or lights.*" A communication. March 15, 1859.

1454.—ALFRED VINCENT NEWTON, of 66, Chancery Lane, mechanical draughtsman, for "*Improvements in casting cylinders and tubes.*" A communication. June 16, 1859.

Parliamentary Intelligence.

HOUSE OF COMMONS.

FRIDAY, JULY 15.

LIGHTING AND VENTILATING OF THE NEW HOUSES.

On the vote of £58,525 for works and expenses at the new Houses of Parliament,

Mr. AYRTON called attention to the outrageous system of ventilation. Sometimes when the House was exceedingly warm, very cold air was pumped in at the feet of honourable members. This drove the blood to the head—(a laugh)—and produced headaches, which often compelled him and others to leave the House. Then, recently, the most abominable odours had been pumped in through the holes and slits at their feet. The smell of the chloride of lime which was used was pleasant enough; but at other times the uncorrected atmosphere of the Thames was wafted through the floor, and then the effect was dreadful indeed. (Hear, hear.) When he found that they were paying £4000 or £5000 a year for what was called ventilation, he thought they really had a right to complain. The fact was that incompetence and extravagance seemed to mark the whole arrangement within this building. For instance, an enormous sum was wasted above their heads in forcing light through plate glass, whereas one-third of that light would be sufficient for the House if it were not placed outside the glass. This extravagant arrangement tended merely to gratify some one's caprice. But from beginning to end the whole building was nothing but a piece of mediæval folly. (A laugh.) It carried them back 400 or 500 years with no other end than to deprive them of all the advantages which science had since placed at their disposal. Instead of ample light there was obscured glass, in order to imitate a period when the manufacture of glass was in its infancy—(hear, hear)—and although our manufacturers now produced the most beautiful crystal, the House was full of little trumpery pieces of glass a few inches square, inserted in lead casing, and dignified by the name of windows. ("Hear, hear," and laughter.) What could have possessed the minds of any man, or any set of men, to insist that everything about the Houses of Parliament should accord with the ignorance of some hundreds of years ago, rather than with the advanced intelligence of to-day! (Hear, hear.) And this was called the perfection of art! Why, ornaments of the most trumpery kind stared you in the face at every turn. Look at the absurd paintings within the House, which led many members to attend very little to what was being done, while some could hardly rise to speak without having their thoughts distracted by the lions and the dragons, and the rest of it. (Laughter.) This trumpery was repeated from one end of the building to the other. If some man at Birmingham had contracted to erect the Palace, one could have understood his reasons for casting the portcullis and the Tudor rose by the dozen, and for sticking them together afterwards in all parts of the buildings; but that men should carve stone after stone with a repetition of the same design, that they should scribble the history of England in writing which nobody could read, so that the very policeman on duty had to say, "You must turn the other way, Sir, to look at that," passed all comprehension. (Laughter) Yet this was called decoration! It was a disgrace to the country to have erected such a place at all, and the decoration showed a poverty of invention which even a schoolboy would pronounce contemptible. (Hear, hear.)

Sir H. VERNEY said he was a member of the committee originally appointed to consider the question of a site for the Houses of Parliament, and that Carlton Terrace was the locality to which their attention was first directed. He added that, after the present site had been decided on, he had heard it said on high authority that one reason assigned for fixing it there was that of the facilities for escape which the river Thames would afford to members in case such a necessity should ever arise.

Mr. CAYLEY said the honourable member for the Tower Hamlets could not be aware that the time was, before he sat in that House, when great inconvenience was felt from lighting the House from within, and that the present system of lighting was regarded as a manifest improvement by honourable members who had experience of the previous one. (Hear, hear.) As to the talk about bad air, before they could hope to see any improvement in the ventilation of the House, he would say, with the venerable Mrs. Glasse, "first catch your hare." (A laugh.) If the honourable member could suggest some efficient means of cleansing the Thames until the process of purifying it through the agency of high-level sewers could be accomplished, he would be doing a great public service. He (Mr. Cayley) believed that the ventilation of the House was as good as it could be, considering the materials which Mr. Gurney had at his disposal for the purpose.

Lord FERMOY said he could remember when the House was lighted with gas, and at one time with lamps, and he thought the present system of lighting was a marked improvement. He recollected also when, in the time of Dr. Reid, the ventilation of the House was much worse than at present. His object, however, in rising was to call the attention of the committee to a large item—£7000 odd—in the vote under consideration for indurating the stone of which the Houses of Parliament were built. (Hear, hear.) He wanted to know what that really meant? His own belief was that, disguise the fact as they might, the whole structure had been built of rotten stone.

Mr. FITZROY said, unfortunately, that was no new subject. From some cause or other—either from the effects of the London atmosphere or from some inherent reason—the stone of which the Houses were built indicated a tendency to decay. That was particularly the case with parts of the building more exposed to the frost and wet than others. In more sheltered situations it did not show the same signs of decay. Various means had been tried to arrest that unfortunate tendency,—one process, in particular, which had been invented by a Hungarian, who did not choose to inform the public of what the substance used by him was composed. A gentleman named Ransome had also been permitted to apply a process, well-known, to several parts of the building, and his (Mr. Ransome's) idea was that if that process were properly carried out it would answer the end in view. The matter remained in doubt when he (Mr. Fitzroy) acceeded to the office he now held, and the question was put to the Treasury whether they would sanction a reference to some high scientific authority, with the view to ascertain, if possible, the cause of the decay, and some effectual remedy against the evil. The result had been a reference to Mr. Faraday, who with that high sense of generosity and honour which always distinguished him—(hear, hear)—said he could not think of acting professionally in the matter or of accepting any remuneration—(hear, hear)—but that he would give the best opinion he could upon the subject. That gentleman spent some hours in examining the stone in different parts of the building, and as a result of his advice a portion of the building had been set apart under circumstances precisely similar for a trial of the processes of the two gentlemen whose names he (Mr. Fitzroy) had mentioned. Time alone, however, could decide the question; and it was under those circumstances that the Government had asked for the vote to which the noble lord (Fermoy) had taken exception. With regard to ventilation several gentlemen had been consulted, but the present officer of ventilation, Mr. Goldworthy Gurney, he believed took the best methods he could adopt to procure an even temperature. (Hear, hear.) The greatest difficulty was experienced at the early hours of the morning, when 300 members sometimes streamed out and left the House very cool for those who remained. Some allowance must be made for the difficulty thus presented, which it was almost impossible to obviate. He believed that the House had a very active and diligent public servant in Mr. G. Gurney. (Cheers.)

Sir B. BRIDGES thought the ventilation in the lobbies would be greatly improved if one or two of the windows were made to open.

Sir A. AGNEW begged to ask whether Sir G. Hayter's picture of the meeting of the House after the first Reform bill had been already purchased.

Mr. FITZROY could not inform the honourable gentleman. He had nothing to do with the pictures in the building.

Mr. TITE said that the art decoration of the building was in the hands of the architect. He did not consider that the character given of the pictures by the honourable member (Mr. Ayrton) was a just one. The artists had, he thought, succeeded very well in the frescoes; and frescoes were more permanent and durable than oil paintings when exposed to the atmosphere of London. So far as he had observed, all artificial systems of ventilation were a failure. (Hear.) Whether you had to ventilate a large room or a House of Parliament, the best way was to open a window. There was, however, a difficulty in opening the windows in the neighbourhood of the Thames. He might state incidentally that 100 tons of lime were now poured every day into the Thames, and he was assured that the influence of this supply would be found very beneficial upon the river. (Hear, hear.) When Mr. Gurney was able to open the windows on the sides next the Thames a great improvement in the ventilation would be experienced. With the exception of Portland stone, almost all the stone used for building in the metropolis was subject to decay. It would be a most lamentable thing, in his opinion, if cement were had recourse to for the purpose of repairing the damage done to the surface of the stone by the atmosphere. (Hear, hear.) The subject could not be in better hands than Dr. Faraday's—(hear, hear)—and no doubt under his care the best chemical protection would be adopted to prevent decay. He believed that Mr. Ransome's process was very moderate in point of expense, and that it would answer the purpose.

Mr. AYRTON said that there was quite sufficient space in the middle of the floor for the purposes of ventilation without bringing the cold air into the House under honourable members' feet. The present state of the Thames had been brought about by the Government and the House of Commons, and the inhabitants of the metropolis had had nothing to do with it. He did not object to the House being illuminated from the ceiling, but it was absurd to use glass so opaque that the light could scarcely penetrate through it.

Mr. J. H. GURNEY seeing a vote of £4000 for frescoes, wished to remark that many of those in the upper lobby showed signs of injury from the dampness of the walls. Some means ought to be adopted to prevent the recurrence of similar injuries.

Mr. CONINGHAM said that the House could hardly be aware how much of the difficulty of ventilation arose from the inadequate supply of air. In the House of Lords there were sixteen different doors upon the basement storey, while in the House of Commons there was but one door on the same storey. The result was a strong draught, and violent alternations of heat and cold. In order to render the ventilation effective, a considerable further outlay was indispensable. The finest public monuments in London were St. Paul's, the towers of Westminster Abbey, and Somerset House, which were all built of the bright and cheerful Portland stone. The experience of time, as to the operation of the atmosphere upon that stone, ought to have determined its selection for the Palace of Westminster. He believed that the palliatives for arresting decay would fail, and he would make it a rule that no public building in the metropolis should be built of anything but Portland stone.

Mr. D. GRIFFITH believed that the most efficient way of ventilating the House was that which they all adopted in ventilating a bed-room—namely, opening a window.

Lord FERMOY suggested that the invention of the Hungarian gentleman should be tested upon a small scale.

Mr. FITZROY said every experiment must be made upon a sufficiently extended scale to afford any test.

Mr. PEASE referred to the difficulty of hearing that members experienced in the House. In some positions, honourable members were completely debarred from knowing what was going on. It was strange that those who designed that House should have ignored the excellent buildings in America and upon the Continent for legislative assemblies. He wished to know whether the account with Sir C. Barry was closed?

Mr. SALOMONS asked to whom they were indebted for the funeral notes

which every hour struck upon the ear of the House? (A laugh.) Who was responsible for the tones of the clock bells? (Hear.)

Mr. FITZROY said that Sir C. Barry's account could not be considered closed so long as any repairs were going on, for he claimed a commission upon those repairs. With regard to the clock, for which he was not responsible, the bells, he believed, were concocted by a gentleman who was considered to be the best judge of bells in the kingdom, and a mixture of metal was adopted that was expected to produce most harmonious tones. Whether the tone was harmonious he could not say, not being a judge of bells, but he feared it could not be changed.

Mr. HANKEY asked whether there was any chance of the bell sounding more like ordinary bells? (Hear.) At present it inflicted great annoyance upon the public and the House. He wished to know who was responsible?

Sir J. PAKINGTON thought there was no hope that the bell would ever give forth any other sound, but suggested that a compromise should be made. It was said the other day that two faces of the clock would not go. Why should not an arrangement be made that all the faces of the clock should go, and that the horrible tolling should cease? (Laughter.)

The vote was agreed to.

MAIDSTONE WATER BILL.

WEDNESDAY, JULY 13.

(*Before Mr.* BARROW, *Chairman, the Hon.* W. G. CAVENDISH, *Messrs.* EWING, POWYS, *and the Hon.* R. HENEAGE DUTTON.)

Mr. HOPE SCOTT, Q.C., Mr. ALEXANDER, Q.C., and Mr. JOHN CLERK, appeared on behalf of the promoters; Sir THOMAS PHILLIPS and Mr. CALVERT for the opponents.

Mr. ALEXANDER said this was a bill for incorporating a company under the title of the Maidstone Spring-Water Company, for the better supplying with water the inhabitants of the municipal borough of Maidstone, and certain neighbouring parishes. It was a bill which, under the new regulations of Parliament, had originated in the House of Lords at the close of the last session; and if it was a bill of considerable importance to the inhabitants of Maidstone at that time, he was sure that importance had been much increased by the present state of the weather, when a supply of pure and wholesome water was, not only a luxury, but essential to the existence of a populous town. Maidstone contained a population of about 22,000 inhabitants, and seemed to be very much behind the rest of the country in its sanitary improvements; amongst which the supply of water did not seem to have met with that attention which its great importance demanded. The committee might be somewhat surprised to hear that Maidstone, though a county town containing the population he had mentioned and a cavalry dépôt, at present obtained its supply of water by means of wells and pumps sunk by the inhabitants in connexion with their private dwellings, and a single reservoir established by the Paving Commissioners of the town at no great distance from it. That reservoir was situated on an elevated portion of the town, called Rocky Hill, and was fed by springs, which did not yield on an average more than 12,000 or 14,000 gallons per day. It would be familiar to the chairman, who had had a good deal of experience with water-works bills, but it might not be known to the committee generally, that the lowest supply that can be reckoned upon as adequate for the sustenance, he might say, of human life, was 20 gallons a day to each individual. That was the estimate which had been taken in Manchester, Liverpool, Bolton, Stockport, and various other populous places; and it had been adopted by persons of scientific acquirements and practical good sense as the least supply which would ensure health and comfort. When he told the committee, therefore, that the town of Maidstone was supplied merely by these private wells and this small reservoir, they would form no very favourable opinion of the manner in which Maidstone was supplied with water. There was also the vicious system of cesspools prevalent in the town, and consequently the private wells and pumps, and those sources from which the majority of the inhabitants derived their supply of water, were tainted very much with the sewerage which oozed from those cesspools, and which, not being carried off by the ordinary system of sewerage, rendered the water exceedingly impure, and very often quite tainted. He need not dwell on the necessity of a good supply of water to a populous town. It would be invariably found that where an abundant supply did not exist, the sanitary condition of the place was low; and Maidstone was no exception to the general law, for on comparing the mortality of this town with that of other towns in the same county, and even of the metropolis itself, it would be found that the rate was far above what it ought to be under the generally advantageous circumstances under which the town was placed, and the geological formation on which it stood. The annual number of deaths in Lewisham, in the eastern part of the county, was 17 in 1000 only; in Ramsgate it was 18 in 1000; in Tunbridge Wells, 18; in Margate, 19; in Dover, 20; while in Maidstone it was as much as 24. If this were compared with the metropolis, it would be found that in the parish of St. George, Hanover Square, the number of deaths annually was 18 in 1000; in the City of London, populous and crowded as it was, it was only 20; in St. James's, Westminster, 22. So that really these parts of the City of London, with all that could be urged against it in point of salubrity, were more wholesome than Maidstone, situated in the country, in the midst of scenery with which the committee were no doubt very well acquainted. There was nothing in the circumstances of the place to account for that higher rate of mortality, and he hoped that with an abundant supply of water the rate of mortality would be as low as that of the places he had named. Another purpose to which water was applied, in addition to the promotion of comfort and personal luxury, was that of extinguishing fires; and there was no supply of water for that purpose in Maidstone. So that, except in the lower part of the town, which might derive a supply from the Medway, it was totally unprovided with any means of extinguishing fires to any degree, and a well-founded alarm had been experienced not only by the inhabitants, but by the Pavement Commissioners. The duty of supplying the town with water belonged to those commissioners, and they had certainly afforded some small assistance in that respect by the reservoir he had alluded to. They had from time to time exerted themselves in a praiseworthy manner in order to ensure a better supply; but the difficulty had arisen in the town of Maidstone which had arisen in other municipal towns, that of inducing the inhabitants to consent to a rate even for their own benefit. Honourable members were aware of the unwillingness of inhabitants of towns to tax themselves even with the smallest amount of rate for the greatest possible advantage. As long ago as 1852 this subject attracted the attention of the Pavement Commissioners—seven long years ago—and he found that resolutions were passed at one of their meetings, held on the 4th of November, 1852, "That it was desirable that there should be a full and sufficient supply of water to the town; and that, as it would be necessary to go to Parliament to obtain the requisite power, it was, in the opinion of the meeting, desirable to refer this question to a public meeting of the ratepayers; and that the Pavement Committee be requested to supply a plan or plans to such meeting." The commissioners consequently directed two gentlemen, Mr. Whichcord and Mr. Bulmer, who were architects in the town, to furnish the committee with plans for supplying the town with water. Those two gentlemen furnished their report in due course of time, which were printed and distributed amongst the ratepayers, so as to prepare their minds, before any general expression of public feeling should be required. The reports, as might be expected, differed very materially, for they differed with respect to the source from which the supply should be drawn. Mr. Whichcord advocated the river Medway, which ran at the foot of the town; Mr. Bulmer advocating a stream running from the chalk hills at Boxley. There were many and very obvious disadvantages attending the selection of the water from the Medway; for although, of course, it would be taken from a part higher up than the town of Maidstone, so as not to be contaminated with the sewerage—or rather the leakage from the cesspools—of a town containing 22,000 inhabitants, yet, inasmuch as the district watered by the Medway was a remarkably fertile district, and that fertility was very much increased with manure, which, although extremely beneficial to the produce of the soil, was exceedingly deleterious and contributed very little to the purity of the water into which it was discharged, the water of the Medway was certainly not of that pure character which it was desirable to supply to so large a number of inhabitants. Besides, the tide, which came as far up the Medway as Hallington Lock—about 1½ miles below Maidstone—had the effect of blocking up the water, and preventing the deleterious matter from being carried off. These reports were presented to a preliminary meeting of the Pavement Commissioners, held on the 3rd of November, and then a resolution was passed requesting the committee to submit to the general body of the commissioners a definite plan—to select either of these two schemes, or to suggest a third—and the commissioners called in the skill of Mr. Hawksley, and laid before him the plans which the two other gentlemen had suggested. Owing to Mr. Hawksley's engagements, a considerable time—valuable time—elapsed before his report was made. The matter was laid in his hands in 1852, and it was 1855 before he could produce any final report; and he decided in favour of drawing the water from the river Medway as the most suitable source. The expense of the works, according to his estimate, was about £19,500, whereas Mr. Whichcord's estimate was considerably lower. Mr. Hawksley's report was treated with the same impartiality that the commissioners treated the reports of the other gentlemen, and that also was printed for the consideration of the ratepayers. It was then resolved by the commissioners to leave it to the Pavement Commissioners to mature a scheme of water supply, and to include all other powers which they might deem advisable for improving the sanitary condition of the town, and to submit the result of their further consideration to a public meeting of the ratepayers, to be convened by the mayor for that purpose. Pursuant to this resolution a public meeting was held on the 2nd of October, 1855, which was very fully attended. Mr. Hawksley was present, detailed his scheme, and advocated its adoption. Much discussion ensued, and the resolution was proposed that Mr. Hawksley's scheme should be adopted, and that the cost of the works should be defrayed by a 6d. rate on the houses. But the moment the word rate was mentioned, opposition was raised. An amendment was proposed to the effect that it would be unjust to impose further burthens on those who were already supplied with water through their wells or pumps, and that the present was an unpropitious period (it was in the month of October) for carrying out the scheme; and it was proposed that the meeting should be adjourned for the consideration of the question as to the formation of a private company, thereby to get rid of any necessity for a rate. The inhabitants therefore adopted what is called in other matters the voluntary system. The resolution and the amendment were both put, and the amendment, obviating the necessity of a rate by the formation of a private company, was carried by what would be called in the newspapers an overwhelming majority. Thus matters remained till the summer of 1858, the heat of which roused even the most torpid feelings of the inhabitants of the town as to the necessity of a supply of water, and which would probably be remembered if it were not thrown into the shade by the intense heat of the present summer. Owing to the unusual dryness of 1858, the springs and wells from which the inhabitants derived their private supply were considerably affected, and the inconvenience altogether was so much aggravated, that persons began to stir themselves again in the matter. Considerable suffering was occasioned, and it was apparent to everybody that something must be done. Several gentlemen of the town and the neighbourhood urged that a private company should be formed, and Messrs. Skidmore and Brennan, solicitors in support of the present bill, set themselves to organize a private company for the purpose, and they obtained the assistance of some of the most eminent and respectable individuals in and about Maidstone. Thus the Maidstone Spring-Water Company was formed under the suggestion of the public general meeting to which he had alluded, and the bill now upon the table was the offspring of that company, and proposed to incorporate them. Among the provisional committee he found the Right Hon. the Earl of Romney—a large landed proprietor living in the immediate neighbourhood of Maidstone—a nobleman not more known as a landed proprietor than by the exertions he bestows on all matters connected with the improvement and well-being of the neighbourhood, the chairman of the quarter sessions of the county of Kent, and a nobleman well-known to have applied himself with a great deal of energy to everything beneficial to the neighbourhood or the county. There was also Mr. Whatman, late member for that division of the county of Kent; Major Scott, a late member for the borough of Maidstone; Mr. Balston, Mr. Bailey, Mr. Bulmer, Mr. Hollingworth, Mr. Loyd, Mr. Lawrence; Mr. Mercer, a banker at Maidstone; Mr. Stacey; Mr. Wickman, who was formerly mayor of Maidstone; Mr. Woodfall, and many other gentlemen of the town. They formed themselves, with the assistance of the solicitors, into the company that was bringing forward the present bill for powers to carry out the objects of their prospectus; and among the officers who were first appointed by the provisional committee was Mr. Homersham, a civil engineer, to recommend the best mode of seeking a supply, and carrying that supply to the town of Maidstone. In the May of 1858, and subsequently, Mr. Homersham visited Maidstone and its neighbourhood, and the various reports of Mr. Hawksley, Mr. Whichcord, and Mr. Bulmer were laid before him; and after giving the subject the fullest attention, he came to the decision that the objects could be best met by sinking wells at the opposite side of the chalk hills from the town of Maidstone, by pumping up water from those wells, passing it through a tunnel underneath Boxley Hill, carrying it into a reservoir at the southern mouth of that tunnel, and thence carrying it by descending pipes, and by gravity, along from Boxley Spring-head to a service reservoir at the top of Pennenden Heath. And that service reservoir being on a higher level than any of the habitations in Maidstone, the water could be supplied to them by gravitation; whereas all those places which were higher than this reservoir could be supplied from the first-named reservoir at the mouth of Boxley tunnel. The whole of the water could be supplied by gravitation. Mr. Homersham handed in a report to this effect. The Lidsing wells having been decided upon as the most advisable scheme, a meeting of the inhabitants was convened. Everything seemed to have been done with the utmost attention to their views and wishes upon the subject, and in June, 1858, they were again requested to take the matter into their consideration.

Several resolutions were passed—first, that the inconvenience to which Maidstone had been subjected for many years past, from the want of an adequate supply of water, had of late so much increased, owing to the unusual continuance of dry weather, and the consequent diminution of the yield of the various springs, that it became the duty of all who were interested in the welfare of the town to take immediate steps for the removal of the existing evil, by obtaining a plentiful supply of pure water from the most desirable source which the neighbourhood afforded; and, secondly, that the proposal that the water supply of the town of Maidstone should be obtained by works established by the local authorities, having hitherto been unfavourably received by the ratepayers, and there being little probability that a majority of the ratepayers would ever consent to the necessary rating, it was the opinion of the meeting that the supply of pure water which the present state of the town so imperatively demanded, could only be obtained by means of private enterprise. The company had therefore the sanction of this public meeting, after the fullest possible consideration had been given to the subject; and after an immense expenditure of time since 1852, they finally agreed in 1858 to the formation of this company. But even then the bill was hardly in a fit state to be launched, for it having been stated during that meeting that the Pavement Commissioners hoped, beyond hope, to be able to bring the ratepayers to a sense of the propriety of rating themselves for the general supply, and leaving the supply in their hands, the provisional committee of these water-works stayed proceedings for a time in order to enable the commissioners to bring the ratepayers to that way of thinking; but without effect. Mr. Homersham was in the meantime proceeding with his various surveys, and the more he examined the country the more he was satisfied of the propriety of his first decision, that the best and purest source of supply of water was to be found at the Lidsing wells at the other side of the chalk range. In August last, Mr. Hawksley was again consulted by the commissioners. He adhered to his former position that the town should be supplied by the Medway. He was, however, supported by very few of the inhabitants; he spoke of raising a larger sum of money than was contemplated, and therefore the plan of the Pavement Commissioners was less popular than ever. Various propositions were made that rates should be granted, but they were all negatived. A public meeting was then held in October, 1858, and it was proposed, after Mr. Homersham's scheme had been before the committee and this private company had been organized, that it was desirable to obtain an abundant supply of water from the river Medway, according to the plan proposed in the printed report of the commissioners on the water supply of 1858; and that application be made to the committee of the commissioners for power to borrow £24,000 to carry on the works. There was a long discussion upon that resolution; the impropriety of resorting to so impure a source was fully discussed and strongly insisted on. The resolution was put, and it appeared that only two individuals voted in its favour. The chairman, therefore, declared that the resolution in favour of obtaining the supply from the Medway was lost, and the announcement was received, as everything is received by a victorious party, with loud cheers. It was therefore fairly decided that there should be no rating system, but that a private company should be established. Mr. Homersham proceeded in his examination, and he (Mr. Alexander) would now proceed to a little more detail of Mr. Homersham's plan. Maidstone was situated at the south of a great chalk range called familiarly the North Downs; the geological formation on which it stood was called the green sand, and above that lay the chalk. The lower section before the committee represented the stratification lying under London and its neighbourhood, and was exhibited with a view of showing a proposition, which some years ago was before Parliament, for deriving a considerable supply of water for London from the chalk range near Watford; but which was not persevered in. From the north of Maidstone, at a distance of 2½ miles, rose the chalk system of the North Downs. The ground rose behind Maidstone up to Pennenden Heath, where the service reservoir was. It then sunk a little, and rose to the top of Boxley Hill, a part of the chalk range. The ground then fell gradually from Boxley Hill, in a northerly direction, down towards the Medway, which approached Rochester and Chatham. Mr. Homersham's plan was to sink a well or wells at the other side from Maidstone of that chalk range, pumping up the water to the surface, and carrying it by pipes of a gradual slope down to the reservoir at the side of Boxley Hill, and thence carry it on to the service reservoir at the top of Pennington Heath. The first thing requisite to be considered in the plan was whether the supply would be adequate; and Mr. Homersham found that by sinking a well to the depth of 256 feet from the surface—which was about 400 feet above the level of the sea, or of the Medway, which might be taken for this purpose as the same thing—he would obtain an abundant supply of water. He found that the water would stand at the height of 240 feet below the surface, that at the dryest season 16 feet of water would be left in his well when not pumped, but that in seasons of average moisture and rainfall there would be 50 or 60 feet of water there. But he did not limit his plan to merely sinking a vertical well, but proposed that a number of airlets or tunnels radiating in a star-like form from the bottom of the well should be opened into the chalk fissures, which would supply a very large quantity of water. It would then be pumped up to the surface, and pass through pipes to the reservoir in the manner already mentioned. With respect to the quantity which Mr. Homersham calculated could be procured he would show the committee himself, and would be supported by gentlemen of great eminence in his profession, who were connected with water-works and might be fully depended upon, that 800,000 gallons could be procured. That quantity, on the estimate already mentioned of 20 gallons a day, for each individual, would supply a population of 40,000; thereby not only giving an abundant supply to the present inhabitants, but making provision for an increased and increasing population, as well as affording a liberal supply for manufactories of various kinds, which required a larger quantity of water than was requisite for domestic consumption. The quantity being abundant, the next question was the quality. Now the water when first raised from the chalk range possessed what the chemists call about 17 degrees of hardness. If the committee wished to have the manner in which that was ascertained it would be given by the scientific witnesses; but the meaning was that the water contained 17 grains of bicarbonate of lime, in solution, per gallon. In other respects, the water issuing from the chalk was of excellent quality. This 17 degrees of hardness, however, was counteracted by a very simple process, which went by the name of Dr. Clark's process—a process invented by Dr. Clark of Aberdeen, and favourably used at the Plumstead and Woolwich Water-Works, and which had been recently tested and adopted by Lord Carlisle at his mansion, Castle Howard, in Yorkshire; it had also received the approbation of a number of scientific gentlemen who had been appointed by Government to examine into and report upon it. As long ago as 1851 the chemists Professor Graham, Dr. Miller, and Dr. Hoffmann considered the question of the supply of water for the metropolis, and in their report to the Secretary of State gave a most satisfactory account of the process. Dr. Thompson and Dr. Hassall, a gentleman who had lectured a good deal on the deleterious ingredients of pools, who had also been employed by Government, corroborated this testimony as to the excellence of a softened supply of spring water. Adopting this process of Dr. Clark, who would be a witness to explain it, the company proposed to reduce the 17 degrees of hardness to 2½ degrees, which it was evident, from the report of the commissioners to which he had alluded, was the lowest degree at which water could be properly used. So much, then, for the quality of the water. When the company went before the House of Lords in the month of March last three other private claims had started into life, in consequence of the general opinion of the ratepayers of Maidstone that the supply should be derived from a private company. One of those schemes proceeded no farther than giving the parliamentary notice, and was strangled in its birth, or died before it was born. Another failed to comply with the standing orders, and the third was Mr. Betts' scheme. Mr. Betts was also a petitioner before the present committee. Although he did not appear by counsel, his name was appended to the petition of certain owners, in support of whom his learned friend appeared, and he signed that petition with two other gentlemen, in the character of a promoter of another scheme for supplying the town of Maidstone with water. Mr. Betts was a gentlemen whose name was not unfamiliar to the committee, having been a very eminent contractor in connexion with Messrs. Peto and Brassey, who was now reaping the result of his hard labours; and among other enjoyments derived from his fortune, he had purchased the property in the neighbourhood of Maidstone, which had the advantage of possessing two or three springs, and those springs Mr. Betts proposed to convert into a source of supply, as a rival scheme to the present one. Those streams, which went by the name of the Aylesford Springs, were not overlooked by Mr. Homersham. There were three streams—the Tottington Stream, Pratten Street Stream, and the Cussington Stream; and the feasibility of all these streams was fully considered by Mr. Homersham, and he would give very abundant reasons why these streams would not supply the town with the same facility and in the same abundance as the plan he proposed. When Mr. Betts' scheme came before the House of Lords, it was found that some mill-owners and occupiers in the village of Aylesford, through which one of those streams passed, were very strenuous opponents of it, not wishing the stream to be diverted from them in any way, as it was essential to the comfort and well-being of the inhabitants. On the case being investigated, the committee having heard everybody on the subject, came to the decision that Mr. Betts' scheme was not worthy of their approval. That scheme was therefore defunct, and the present bill came before the committee of the House of Commons for their sanction. One of the reasons why Mr. Homersham decided against these springs was, that under the most favourable circumstances they would not yield more than 524,000 gallons per day. He gauged them on two occasions. On the first occasion he considered they would only yield about 374,000 gallons in the 24 hours; but, in consequence of its having been urged that he had taken an unfavourable occasion for gauging, the subsequent gauging was made, and it was found that the supply was increased to 524,000 gallons, and that quantity, being so very far short of the 800,000 gallons which would be derived from the wells at Lidsing, of course he had no hesitation in deciding that the Lidsing scheme was the proper one; independently of which, the Aylesford springs could not be parted with without considerable inconvenience to the inhabitants, who were unwilling to give up a stream for the supply of Maidstone, which was essential to their own existence, and also the channel of carrying off their sewerage to the Medway. There was also, he thought, a miller who objected very much to the stream being taken. And when the quantity requisite for the inhabitants of Aylesford was deducted from 524,000 gallons, which was all the streams yielded under the most favourable circumstances, the residue would be far from sufficient for the supply of Maidstone and the neighbourhood; which was, therefore, somewhat singular, especially as Mr. Betts had no plan that he could lay before the House, that he should still continue his opposition to the bill. The promoters thought that as the whole question had been fairly dealt with by the committee of the House of Lords, and the importance of obtaining a supply of water was increased every day by the great heat of the weather, Mr. Betts, who was a new settler in the locality, and was no doubt a man of very amiable feelings, and was willing to do everything he could, even to the sacrifice of his own private views, for the advantage of the neighbours amongst whom he had come to live, would have relinquished his opposition, and not given his signature to the present petition. That, however, was not so. And although he did not now appear as the representative of a company to promote his scheme, he sought to obtain the rejection of the bill, and thereby postpone the consideration of the question of a supply of water to the inhabitants of Maidstone to the year 1860. On the 19th of May, Mr. Betts wrote to Mr. Mercer, a member of the provisional committee, stating that he had no desire to prolong the contest for the supply of the town with water, but could not permit injury to be inflicted on the property of himself and others; and although he had not changed his opinion as to the sources of supply, he was willing personally to withdraw from the contest providing clauses were inserted in the bill which would, as he conceived, meet the justice of the case. The clause he wished inserted was to prevent the company from sinking their wells below the depth shown on the plan. Mr. Betts' suggestion was taken into full consideration by the directors of the company, who referred it to their engineer to examine into the matter, and a letter was sent by the solicitor of the company enclosing a resolution to the effect "that Mr. Mercer be requested to inform Mr. Betts that the directors being decidedly of an opinion that the proposed well at Lidsing cannot in any way interfere with the springs at Aylesford, they must decline to agree to the insertion in their bill of the clauses required by him." In adopting this resolution, the directors consider that while the clauses suggested by Mr. Betts would confer no practical benefit on him, they might possibly occasion serious inconvenience to the company. The directors, therefore, came to the wise determination not to agree to the insertion of Mr. Betts' clauses, and for very abundant reasons, in the judgment of Mr. Homersham and other gentlemen who had been consulted. They considered that the depth proposed—226 feet—would be sufficient, but that it would be unwise to fetter themselves, because it might be necessary to go a little lower down; but in no case could they interfere with Mr. Betts' streams, for the simple reason that they were on the opposite side of the chalk range. Mr. Homersham did not go to the Maidstone side of the chalk range, but went over Boxley Hill, and got his supply from that portion of the range which sank towards Chatham and Rochester. It was of the greatest moment that a question of such importance should be settled this session, and that the present time should be seized, when the inhabitants of Maidstone were all of one mind as to the desirability of the supply being undertaken by private enterprise. The promoters would be able to satisfy the committee, upon irrefragable testimony, of the facility with which the works could be carried out. Mr. Homersham, the engineer responsible for them, would be called, and the committee would also have before them gentlemen of greater experience, particularly in the construction of water-works connected with the chalk formation, than anyone in England. Mr. Milne, the engineer of the New River Company, with which he had been connected

many years, had examined into the plans of Mr. Homersham, and, fortified by his own experience of the water to be derived from the chalk range which now to some extent supplied the New River Company, and by which it was proposed some years ago to increase the supply, he would no doubt confirm Mr. Homersham's evidence in every particular; not only as to the quantity, but as to the quality of the water derived from that source. Mr. Hawksley, a gentleman of eminence in his profession, when he gave evidence before the House of Lords in support of Mr. Betts' scheme, was obliged to admit that he had never sunk a well in chalk in his life, showing that he had not the same experience which Mr. Milne had in the matter. It was no derogation from Mr. Hawksley's general qualifications that he had happened to be boring in other stratifications, but Mr. Milne would not be open to that observation, and his evidence would be fortified by those actual well-sinkers and contractors who had dealt with this particular stratification, who knew where the water was, and the quantity in which it was likely to be found. The committee would also have satisfactory evidence that Mr. Betts' springs could not be affected by the works of the company; indeed, it hardly required the assistance of scientific evidence to show that, when it was known that Mr. Homersham proposed to obtain his supply from the other side of the chalk range. He (Mr. Alexander) did not think there was anything in the case of the other petitioners that called for any particular observation. He believed their apprehensions were groundless. Their principal allegation was that some of them were the owners and occupiers of the lands and mills in the neighbourhood, and entitled to the use of the water and the streams that flowed from the same chalk formation, and that some of them had wells sunk in the chalk from which they derived the supply of water necessary for their various purposes, and that they would be therefore very prejudicially affected by the works of the company. It was also alleged that the petitioners objected to the said bill and the powers thereby sought, that such powers were unnecessary and uncalled for, and that a supply of water could not be obtained from the works proposed. That if by sinking the wells to a much greater depth a supply of water was obtained, the springs, streams, and wells of the petitioners would be affected. Well, if this scheme for supplying the town with water failed, it was the best scheme that could be selected. It might be said in passing that Mr. Betts' scheme was coupled with an advantage to himself, as he would derive a rent for the water which was to be diverted, to the amount of £500 or £600 a year, which would be an ample remuneration to him; so that he did not, as a mere gratuitous act on his part, give up the streams for the public benefit. Looking at the signatures to the petition, several of which did not appear to be at all connected with Maidstone, he could not help thinking that it was merely an attempt to set up the defunct scheme of Mr. Betts by postponing the company's bill for the present, and depriving the inhabitants of Maidstone, of which the petitioners formed a very fractional part, of the supply of water which they must have now or never, for it was most probable that the discordant opinions of the inhabitants would never again be reconciled. He trusted, therefore, the committee would have the same confidence as the House of Lords in the scheme for which he had the honour to appear.

The *Earl of Romney*, examined by Mr. CLERK.

I reside at the Mote, near Maidstone. I am the largest land-owner in the parish. For some years past I and other petitioners in the neighbourhood of Maidstone have been anxious to get a supply of water for the town; that supply has been very short up to the present time. It has been partly from wells and partly from the small reservoir. The public supply has hitherto been dependent on the exertions of the Pavement Commissioners. Private parties have wells. The commissioners have for some years made efforts to supply the town by means of a compulsory rate. Meetings have been held from time to time in Maidstone to consider various plans. I believe those plans have always been met with disfavour by the inhabitants. A plan was brought forward last year for supplying the town from the waters of the Medway—that met with disapprobation at a large meeting of the inhabitants. A private company was formed in the autumn of last year by myself and other noblemen and gentlemen resident in the neighbourhood. Mr. Whatman, at that time member for West Kent, was one of the provisional committee, and also Major Scott, one of the members for the borough; the other gentlemen, Mr. Balston, Mr. Barling, Mr. Woodfall, and others, were either engaged in business or residents of the town. A plan was laid before the provisional committee by Mr. Homersham, whom we selected to act as our engineer. The inhabitants of Maidstone, at a meeting in the month of October, refused to leave the water supply in the hands of the Pavement Commissioners; and about a month after instructions were given to Mr. Homersham to decide on some plan. The plan suggested by him was to take water from a chalk range four miles north of Maidstone, at a place called Lidsing. Before that plan was ultimately decided upon, Mr. Homersham was directed by the provisional committee to examine certain other springs in the neighbourhood of Maidstone. As a resident in the neighbourhood, I was aware of certain springs which are the property of Mr. Betts. I have not the slightest interest in taking the water from one source rather than another; and I think this was the case with the other members of the provisional committee. We were only anxious to get a large supply of good water. Mr. Homersham examined the springs upon Mr. Betts' property, and at the same time Mr. Charles Mercer, one of the provisional committee, was requested to see Mr. Betts to ascertain what price he put upon these springs. We afterwards received a report from Mr. Homersham as to the quantity of water that could be obtained from them, and we considered that the supply from them would be insufficient for the town. The price that Mr. Betts asked was also a consideration with the committee. Besides finding that the supply was insufficient we found that the price asked was considerable; and there was a further compensation for mill-owners demanded. Mr. Homersham had then final instructions to proceed with this scheme, and the other was given up. That was in the month of November. Mr. Betts never attended any of our meetings for the water supply. I do not know whether these meetings were convened by circular sent to every gentleman resident in the neighbourhood or not. After the provisional committee had decided to obtain the supply from Lidsing, we found that Mr. Betts had determined to oppose our scheme. We found that out in February. We were not aware of it in November. I do not recollect when we received a letter from Mr. Betts; it was some time before they came to Parliament. I am aware there is a petition from several persons calling themselves owners of land and mill-owners in the parish of Boxley. They petition against this bill under the apprehension that their rights will be interfered with by the diminution of the supply of water from the chalk hills. I am a large proprietor in the parish of Boxley; one of the largest. I have a residence there, where I used to reside before I went to the Mote. My attention was called by Mr. Betts to the possible diminution of the Boxley Stream by reason of the sinking of the wells at Lidsing, which is about two miles and a half from the place where the springs issue from the chalk. I do not join in the apprehension expressed by Mr. Betts that those springs would be affected. A great number of the petitioners are persons not having the slightest interest in the town. I have no predilection in favour of any particular scheme. I do not care whether the work is done by the Commissioners of Pavement or by a private company, so as a plentiful supply of good water is obtained.

Cross-examined by Sir THOMAS PHILLIPS: I do not anticipate that the proposed works will at all diminish the springs on my own property. I am aware that men of considerable experience in well sinking are of a different opinion. Some have given their opinion one way and some another. I am generally well acquainted with the Aylesford springs. I had a very strong opinion last year that these springs should be examined. I recommended an examination of them in order to see whether there was enough water there, and my first impression, from my general knowledge of the district, was, that they were the proper source. They would not give a natural supply, because you would still have to pump the water from the low level.

Sir T. PHILLIPS: Is the natural vein for the water from the chalk range running to the north?

Witness: Running to the south.

Sir T. PHILLIPS: Do you think it necessary, because the range is to the northward, that the water must go to the northward?

Witness: It is not necessary; but I believe it does there. That is the opinion I have formed. The petition purports to be from persons residing at Boxley—they say they reside there. I had an impression at first that Aylesford was the most convenient source, but it was an impression which was liable to be upset at any moment; and having the whole of both schemes before me, I selected that which seemed the best. It was a convenient source so far as the water goes; but there are other matters to be considered in a question of this sort besides water supply; there is the question of costs and many other things. I found, from the report of Mr. Homersham, that the yield was 374,000 gallons; I think it was afterwards discovered that the first examination was imperfect, and that it was nearly 600,000.

Re-examined by Mr. CLERK: Mr. Docwra has guaranteed to find water; and he has agreed not to be paid unless the supply reaches 800,000 gallons. I am aware that one of Mr. Betts' streams runs through the town of Aylesford, and the inhabitants were represented by counsel in the House of Lords and objected to have that stream taken, claiming their right of use.

Major *Scott* having been called,

Sir T. PHILLIPS said: We do not propose to dispute the necessity of the supply of water for the town of Maidstone; the questions we shall present to the committee are as to whether the scheme as proposed to you is a proper and fit one, and, if it should give an adequate supply of water, whether we are not entitled to certain protection, supposing the committee should be of opinion that the bill ought to pass?

Mr. HOPE SCOTT: If my learned friend would go a step or two further, and admit that the want of the town is a crying and an immediate want.

Sir T. PHILLIPS: That depends upon what "crying" means.

Mr. HOPE SCOTT: My learned friend's view is that it may be delayed two years.

The CHAIRMAN thought that as six or seven years had been occupied in concocting and considering these schemes, the necessity could not be considered very pressing. The committee, however, were clearly of opinion that there was no necessity for evidence as to the want of water for the town of Maidstone, and the promoters might go into their engineering evidence, and it would be a matter for inquiry whether the supply proposed to be taken by the wells would injure the petitioners.

Charles Russell, Esq., examined by Mr. HOPE SCOTT.

I am a banker in Maidstone, and one of the promoters and a provisional director of the Maidstone Spring-Water Company. There is no question whatever as to the pressing want of water at Maidstone. I have had no local or other prejudice as to the sources from whence the supply should be obtained. There have been four schemes for the supply of the town, all of which I have investigated. My only consideration was what would be for the benefit of the town. If the Aylesford springs had yielded a sufficient supply of good water, I should have had no objection to them. In fact, I have had a very strong impression in favour of Mr. Betts' springs as the most economical and available source. I had the pleasure of seeing Mr. Betts upon the subject—he stated that he only wanted what was fair and reasonable; and in the course of conversation I said that was scarcely such an answer as I could mention to others, and that it would be more satisfactory if he would name a sum—he then named a sum at which he was willing we should take the water. He said he had been applied to by a company that proposed to supply the town of Chatham, and he had been offered a thousand a year, but as Maidstone was a much smaller place he would take a much less sum. I asked what he thought reasonable, and he said he considered that a sum commencing at £300 a year and going up to £600 would be fair and reasonable. There was also to be compensation to tenants besides this annual payment, mill-owners were to be compensated, and any persons who had a claim. The rent was simply to include Mr. Betts' right in the matter, apart from the rights of others. An inquiry was directed by some of the gentlemen of the town as to what the yield of these springs was, and their capabilities of supplying Maidstone. The result was such as to satisfy me and the other directors that it was not sufficient. The report we received was distinct and clear upon that point, and we at once passed by the scheme. I have been conversant with schemes for supplying the town from the Medway, and from the green sand and from other sources. I investigated the green sand scheme and did not arrive at a favourable conclusion as to the Medway scheme. I read the evidence which has been given by several persons on the subject. The water is a very thick and turbid water. It is certainly handy to the town, but it is what Mr. Simpson, the government engineer, used to call "pea soup;" not quite so rich as the Thames perhaps, but very nearly so. We select the present scheme because that we think it the most feasible and the most practicable. I am acquainted with Clerk's process. I live in Lord Romney's house at Boxley. A very small proportion of the signatures to the petition are those of the Boxley owners. I have no fear as to the spring of Boxley being interfered with. Chalk wells are not a novelty, I have one myself, and my neighbours have wells of that description, and therefore I know what the effect is likely to be. The share list is by no means full yet. I do not attribute this to any want of interest on the part of the residents in the locality. No application has been made to any parties to take shares since the scheme has been started. People want to see whether the bill is obtained. If it is, I do not think there will be any difficulty in raising the capital. I believe about two-thirds is subscribed.

Cross-examined by Sir T. PHILLIPS: I do not know how many shares have been taken. No canvass has been undertaken for the purpose of raising the capital. But now you call it to my recollection, I believe some parties were applied to; it was not a house-to-house canvass throughout Maidstone. No doubt the ordinary means were taken for getting subscribers.

The CHAIRMAN: Is it one of the objections that the parties promoting are not in a condition to carry out their scheme?

Sir T. PHILLIPS: My learned friend has examined upon this.

Mr. CLERK: There is no such allegation in the petition.

Sir T. PHILLIPS: I was merely wishing to test what the answers given to my friend amounted to. If he had not put any questions, I should not have put any.

Mr. CALVERT: Their preamble states that there are parties who can carry out the scheme. They hope to show that, and we wish to see whether it can be carried out to the extent they say or not.

Mr. CLERK: We ask the question to satisfy the committee. But you have no right to go into the matter; there is no allegation to that effect.

Mr. CALVERT: I beg your pardon, we have a right to go into and negative every part of their preamble.

Mr. CLERK: If there is no allegation as to the deficiency of capital, you have no right to raise the question.

The CHAIRMAN: What is the sum proposed?

Sir T. PHILLIPS: £30,000.

The CHAIRMAN: What is the sum subscribed?

Witness: I believe it is £20,000.

Sir T. PHILLIPS: Look, if you please; tell us the exact amount.

Witness: The number of shares subscribed is 1400 at £10 each. I have no doubt the usual means have been taken for subscribing them. I am quite unable to say when the subscriptions in this list were obtained. I did not go round. I do not know that Mr. Stephen Kelsey, an occupier of a mill at Boxley and a petitioner against the bill, anticipates that the supply of water to Boxley will be interfered with. I do not know anything about Mr. Kelsey; I only know that he is a petitioner against the bill, and lives in East Kent, about thirty miles off. I believe he is the owner of the mill at Boxley that is supplied with water out of the chalk, but I do not know it. I believe Messrs. Walker and Pugh are, as trustees, owners of another mill there. I know they have signed the petition, and their tenant has also signed it. The rector of the parish has signed it, and so has the curate, and, I believe, many other persons. It is not a mere isolated apprehension, but I do not think it generally prevails. At a subsequent interview, Mr. Betts said he only wanted what was fair and reasonable, and stated that he would leave it to any one to state what was fair. I believe Mr. Betts is obtaining a very large quantity of water from green sand by means of a well sunk at a very small cost.

Re-examined by Mr. CLERK: I conversed with Mr. Richards, a baker of Boxley, upon the supply of water at Boxley being interfered with long before I knew that he signed the petition, and I do not think his apprehensions were very great. Many of the persons who signed the petition were advocates for the supply of Maidstone with water from the Medway. The list contained the names of the principal merchants, traders, and others, resident in Maidstone—a large majority of them.

Mr. *Samuel Homersham*, examined by Mr. CLERK.

He said he was a member of the Institute of Civil Engineers, and had been for twenty years engaged in designing and constructing works for the supply of towns with water. He had seventeen years been occupied in business on his own account. He was employed by the Brighton Company, which supplied the town with water from chalk; also for the Canterbury and Wolverhampton Companies, and the Plumstead and Woolwich Water Company, which was supplied entirely from the chalk. He had carefully examined the chalk formation round London, with regard to the water supply of the metropolis. He was engineer for the Spring-Water Company, established for supplying the north-western portion of London with water from chalk. In conjunction with persons of high scientific standing, he examined the whole of the chalk formation round London as shown upon the map before the committee. There were some chemists employed by the Government to report upon the supply of water from the chalk at that time. Professors Graham, Miller, and Hoffman were appointed in 1858, as a commission, to report upon what source they considered was the best for the supply of London with water. These gentlemen made a very elaborate and careful report, in which they emphatically stated that they considered London could be best supplied with water from the chalk, and in abundant quantity. The water so obtained from chalk was very pure, but it had a certain degree of hardness from the presence of a quantity of bicarbonate of lime. It was free from any putrescent or fœcal matter, and contained a large quantity of oxygen gas. It had from 14 to 16 degrees of hardness. It possessed one great advantage over the river supply from the fact of its being of an even temperature at all seasons of the year. In the present hot weather, the water coming from the springs was at 54 degrees of temperature, and in the winter it would be the same when river water was at 34; and by taking the water into a covered reservoir and distributing it through pipes at a proper depth, it might be delivered to the consumers' houses within two or three degrees of its temperature in the well; so that in the summer it would be 54 or 55 degrees, and in the winter 47 or 48. The hardness of the water was one of the principal objections, but that was to a great extent obviated in practice by the use of Dr. Clarke's process, which had been employed at the works at Plumstead with marked success. Last year he (the witness) put the plan in operation at the seat of the Earl of Carlisle, and both his lordship and household highly approved of it. It had been used with advantage by several other persons, and also in some works in Surrey, where it was highly approved. By the application of Dr. Clarke's process, water could be softened from 16 or 17 down to 2½ degrees of hardness. Drs. Thompson and Hassell reported to the Board of Health upon the beneficial effect of the employment of Dr. Clarke's process at Plumpstead. They were appointed in 1855 to inquire into the quality of water then supplying London, and they reported, in a very marked manner, in favour of the Plumpstead Company, which they said furnished the best water that was supplied to London. The water was also examined by three other gentlemen, inspectors of the Board of Health, who reported very favourably upon it. In May last, he (the witness) was called upon by the promoters of the company and requested to examine the neighbourhood of Maidstone, to ascertain where the best supply of water could be obtained. They gave him several reports, and said it would facilitate their operations in getting up the company if he could recommend the Medway as a source of supply, at the same time desiring him not to be fettered by any opinions of others if he conceived that a better source could be chosen. On investigating the subject, he rejected the Medway, on the drainage ground of which there was a resident population of 93,000. A large quantity of sewerage matter found its way into the river, and the water had been examined by Dr. Lancaster and Mr. Campbell, who reported that it was unfit for the use of the town population; which agreed with his own knowledge of towns supplied by rivers. Such schemes were usually very expensive, and he abandoned the Medway as a source of supply. The ground round Maidstone was extensively used for hop gardens, and he believed it was highly manured. He did not know particularly about the manuring of the drainage ground, but his great objection was the flow of the sewerage into the river. He knew that the water was unwholesome, and with his knowledge of that fact it would have been wicked on his part to attempt to bring it into Maidstone. He examined the country all round, and was three or four months considering what would be the best source of supply, and he had formed his opinion that the best plan would be to sink a well at Lidsing in the chalk formation, and convey it thence to Maidstone. In the month of June he was present at a public meeting at Maidstone, the mayor in the chair, at which he explained his scheme very fully, and entered into the objections he entertained to the Medway. The meeting repudiated the Medway, and were in favour of the supply from the chalk formation. He believed the Paving Commissioners were intending to bring forward a scheme of their own at a later period. A subsequent meeting was called by them in the month of October, which determined against the supply from the Medway. His (the witness's) scheme was fully discussed at the second meeting. He had orders to prepare the deposited plans, and he accordingly matured his scheme and acted according to his instructions. In November, he received orders from the directors to examine three springs—Springhead, Tottingdon, and Cushington. He took great pains to measure the springs accurately, and he found that their united yield was 374,285 gallons per day. He also found that the water flowing from those streams was fully appropriated for mills, watercress-beds, &c., so that it would be almost impossible, without enormous expense, to procure the water for the purposes of the town of Maidstone. He considered it a scheme impracticable, and accordingly abandoned it. The spring at Tottingdon supplied a stream that runs through the town of Aylesford, and received its sewerage. The inhabitants of Aylesford appeared before the House of Lords to protest against their being deprived of the use of that stream, as it served to remove a portion of the sewerage from the town. A certain portion of the sewerage was carried away by the stream into the Medway. The population that would be supplied by the proposed works was 26,000. In constructing works of that kind, it was usual to provide for an increase in population. In the main works it was usual to provide for a supply of 25 or 30 per cent. more than was required by the existing population. The amount of what was required per head was about twenty gallons a day. That was a fair average for a town like Maidstone, but in many towns as much as thirty-five or forty gallons was required. It was usual, also, to calculate for a considerable supply to wholesale consumers for trade purposes. He had made his plans for the supply of 700,000 or 800,000 gallons a day. Lidsing was about four miles in a north-easterly direction from Maidstone, and was situated on the green sand, as shown in the map. Near Maidstone, in the direction of the proposed works, was the lower green sand; after that came Penenden Heath, and then, further north, the Gault, a sort of stiff impervious clay; beyond that was the rise of the chalk hills, the lower portion of which consisted of chalk marl, which was almost as impervious as gault itself. The hills formed almost a mural precipice, rising to a height of 600 feet above the level of the sea. The depth of the well would be 254 feet. At the bottom of the well it was proposed to make several tunnels in the south-east and north-west directions, in order to collect the water as it fell from the hills. The chalk at that point absorbed every drop of water, so that over the entire area it was impossible to find a single surface stream of any kind, nor could water be obtained without sinking a well from 200 to 300 feet deep. The whole of the chalk below was completely saturated with water, and after the heaviest rains one could not discover a drop of water flowing from the steepest part of the hill, the rain being absorbed as fast as it fell. The soil was light, very full of stones, and inferior in an agricultural point of view. The bottom of the well would be about forty feet below the level of the sea. The tunnels would be driven under the line of saturation (which was a common practice), in order to collect the water. It would then be raised, and softened at the top of the well. It would be carried by a pipe to the tunnel, which went through the chalk, and thence into the reservoir, which would supply the higher part of the district; while to Penenden Heath and Maidstone the water would fall by gravitation. Tunnels would be made about forty or fifty feet each way. By the plan proposed there would be no difficulty in supplying Maidstone with water, or even ten or twelve Maidstones. There were no surface rivers, and the water collected entirely consisted of that which fell on the hills and was then absorbed. It came from no other source whatever. The witness was asked by the committee whether he meant to say that all the water from which he intended to get a supply for Maidstone fell on the top of the hills indicated by the yellow mark on the map. He replied that that was his meaning—that all the water fell on the hills and on the sides, in the chalk formation, and was derived from no other source. In reply to a question as to what would be the superficial area upon which the rain-water would fall for the supply of the requisite quantity, he said, taking two miles radius and four miles diameter, giving upwards of twelve square miles, a fall of three inches of rain in the year would give 700,000 gallons a day. The water escaped at the present time into the estuary of the Thames and the Medway. The water did not appear on the surface in the least, but there were underground rivers which discharged themselves into the sea, as surface rivers did, but at a distance below. The blue line on the map indicated the point of saturation. In a wet season it would be fifty or sixty feet higher. The stratification of chalk lay in a north-easterly direction. A paper had been published by the Philosophical Society prepared by Mr. Bland showing the line of saturation in the chalk. Mr. Bland took a survey of the place for purely philosophical purposes, and the levels agreed with his own within a foot. It was necessary to go thirty or forty feet below the line of saturation, and by making tunnels a good supply of water could be obtained. Of course it required judgment to decide as to the situation in which the wells were sunk. If a good position was chosen, the supply of water would be abundant. He had no doubt that a sufficient supply of water would be obtained by the proposed plan. The capital of the company was £30,000, and there were borrowing powers to the extent of £7000. The amount required for the construction of the works was £23,563, with lands and accommodation. A considerable margin was left for distributing the water—namely, £14,000. He was aware that there were apprehensions that the springs at Boxley and Aylesford would be affected, but he thought such apprehensions groundless. These springs were three miles distant. They were in the chalk marl, which was above the lower green sand, and the chalk marl was impervious to water. They were insignificant in quantity—the whole yield from them being only 116,000 gallons a day. It would be impossible to drain the spring by sinking a well at Lidsing. He had seen wells in operation within a short distance from one another in the chalk, and there was no interference or connexion between them. There were two wells within about 100 yards of each other—one of them yielding two millions of gallons a day, but it was found that one well did not affect the other. He was aware that a good deal had been said as to the improbability of getting the proposed quantity of water at that height above the level of the sea. He had lately sunk a well in Surrey, near Caterham, twenty-five miles further on in the same range of hills, and he found water there standing at 283 feet above the level of the sea. In the year 1840 he took a level of the water on the east of the range of chalk hills at Maidstone. He was then reporting on the supply of water to the town of Maidstone, and he found the water there stood at 249 feet above the level of the sea. At Chiltern Ridge the water stood at 470 feet above the high-water level. He had some levels which he had taken himself from the river Colne, showing the existence of water at a considerable height above the level of the sea. One of them, 19½

miles from the Thames, showed the water level to be 230 feet above Trinity high-water mark, and when 260,000 gallons per day were pumped out, the water was only lowered three or four feet. At Nash Mill, the water was 221 feet above Trinity high-water mark, and it had been pumped out at the rate of 407,000 gallons a day since 1845, the water being lowered only three or four feet. At another place the water was 205 feet above Trinity high-water mark, and 500,000 gallons a day had been pumped out since 1843. There was no connexion between the well and the river. In one place no water could be got out of the well by boring close to the river; but by putting a bore-hole down and opening fissures in the chalk at a greater distance from the river, the water could be obtained. In 1851 and 1852 the river Vere was short of water in the dry seasons. There were a great many mills on the stream, and an engineer offered to put down five bore-holes that should yield a million gallons a day and yet overflow, stating that he would not ask for payment if they did not overflow above the head of the Vere. The bore-holes were put down under his (the witness's) superintendence, and he could speak from his own knowledge as to to the result. The water did overflow at a level of 281 feet above Trinity high-water mark, and was overflowing to this day. A great many towns had been supplied with water from the chalk for many years, and the supply did not in the least degree decrease. In Brighton, for instance, one and a-half or two million gallons per day had been pumped out without any difficulty. When the well was first sunk it yielded 200,000 or 300,000 gallons a day: as the town increased an additional supply was wanted; the radius was accordingly extended, and now as much as a million and a-half gallons of water was obtained. At the Plumpstead works the well yielded, five years since, 600,000 gallons a day. Some time ago he put down a bore-hole eight inches in diameter, and the quantity of water obtained was doubled. The cost was only £600. Whenever a further supply was wanted it could be obtained by a moderate outlay. It was not always the case that the deeper you went the more water you could obtain, because the bore-hole might extend into the marl, a stratification where the water could not get away. The line of saturation was determined by taking the level of the wells existing along the locality. It was not always the same as the level of the sea. The line of saturation near the sea was above the level of the sea, but as you receded it rose to a considerable extent.

Cross-examined by Mr. CALVERT: Some of the wells in the neighbourhood were much deeper than 250 feet, and some were shallower. Those that were deeper had gone below the line of saturation. Hardly a bucket of water could be obtained from the wells that had gone much below the line of saturation. By going 20 feet below the line of saturation sufficient water would be found to supply Maidstone, but 100 feet lower there might be no water at all. He had already said that it was possible to go too deep. When the well was sunk it was necessary to drive out tunnels or take down the bore until a subterranean river or spring was reached. It was not until that was touched that any large supply of water could be obtained. In sinking a well one of these might be missed, but by cutting a lateral tunnel it was easy to hit upon them and so get an abundant supply. The line of saturation was not horizontal, but sloped, at an inclination of about 40 feet in a mile. The well at Brighton was 70 or 80 feet deep. At one season of the year it stood about 60 feet above the level of the sea; at another season only 12 or 14. At one season of the year, although there might be a million and a half gallons pumped out of the well, the water instead of falling actually rose from 14 to 40 or 50 feet; at another season the water would fall, whether it was pumped or not. When he said that the water obtained from the Lidsing well fell over the surface, he did not mean to say that it all fell immediately around the well: it fell on the top, and it was merely intercepted in its way to the Medway. The Plumstead works were about three-quarters of a mile from the Thames, and the water stood at the level of Trinity high-water mark. At Chiltern Ridge the water was 470 feet above the Trinity water-mark. There was probably not a river within six or seven miles of it. The nearest river was 83 feet above the level of the sea, and the wells were 283 feet. They had not begun to pump yet, but there was an abundant supply of water. One of the wells he referred to was Watford, where the water stood at 169 feet above high-water mark. It yielded 1,800,000 gallons a day. The nearest river was the Coln, which stood at 168 feet above high-water mark. Some experiments made by Mr. Stephenson showed that there was no connexion between the well and the river Coln. The depth of the well at Lidsing was 254 feet. There were to be two pumping engines; and it was proposed to supply 700,000 gallons a day. The consumption of fuel would be about 370 tons in the year. There were to be two reservoirs; one in the tunnel, and one at Pennenden Heath—one at a higher level than the other. The total lift from the top of the hill to the summit of the conduit was 362 feet. He believed that plenty of water would be obtained at a depth of 254 feet. He did not think they should require to go deeper; but he did not desire to confine himself to that depth.

Mr. CALVERT: Are you aware that it was proposed to put an end to all controversy if you would insert a clause in your bill by which you would bind yourself not to go below that depth?

Witness said he was not aware of that. He was consulted upon the subject and informed that Mr. Betts would withdraw his personal opposition if he would undertake not to go lower than 254 feet. He did not, however, know what was meant by "personal opposition," and therefore thought it better to agree to no terms of that kind. There was a limit of deviation in the bill to the extent of 5 feet. He had not held out to the public that he should not go lower than 254 feet. It was possible he might wish to go lower.

Mr. CALVERT: Is it your plan to come before the House of Commons with a section showing a depth of 254 feet, and upon the footing of this bill to go 150 feet further?

Witness said it would not make any difference in the working expenses; and he thought they ought to be allowed that liberty. He had no doubt that water would be obtained at the level he had stated, but he asked the committee not to tie him down if he should require to go 10 or 20 or 30 feet lower.

Mr. CALVERT: You tell the owners of water that you have a project for going a depth of 254 feet; and then, having obtained the sanction of Parliament, you say you are to go as much further as you please, whether you injure the neighbouring water owners or not. Is it really intended to go as much further as you like?

Mr. ALEXANDER objected to the question, which, he said, was tantamount to asking the witness if he intended to violate the law.

The committee permitted the question to be asked.

Mr. CALVERT: Is it any part of the plan of your company to go beyond 250 feet?

Witness: I do not expect that we shall want to go deeper, but all subterranean work is of a somewhat uncertain character; and if I found that an additional supply of water could be obtained by going another 150 feet, I should not like to be prevented. It would be merely putting down a bore-hole to bring a supply from a large area.

The CHAIRMAN: Do we understand that you do not think yourself bound by the plans you have deposited?

Witness: I did not intend to convey that.

Mr. CALVERT: Do you mean to take powers to go as far as you like before you get water?

Witness: I did not say to that extent.

Mr. CALVERT: Let me ask you again, do you want to continue boring down as far as you can go until you can get water?

Witness: I should like to have the power. The estimates would not have been any larger if I had proposed to go down 300 or 400 feet instead of 250—not a sixpence. He was positive in making that statement. He had already explained to the committee that he had put a bore-hole down 600 feet at a cost of £600, and thus obtained an increased supply of 600,000 gallons a day. That did not alter the level of the well. Putting down a bore-hole would not enable them to pump the springs lower. It merely gave the water in the body of the chalk greater facility for rising, and would not increase the estimates at all. He was not aware of having said anything before the House of Lords intimating any intention to go deeper than 254 feet. He did not remember any question being asked him on the subject. He was aware that some engineers had given evidence that Mr. Betts' springs would be injured, but he did not think they had much experience in regard to water from chalk. The probability of their being injured would not be at all increased if the works went lower than 254 feet. He believed it was quite possible that sufficient water would be obtained at the depth he had mentioned.

Mr. CALVERT: Will you act upon that possibility, and admit a clause to prevent you from going further?

Witness said if the committee forced it upon him, but not willingly. He asked the committee to consider his position. Here was a company about to lay out £30,000 upon his assurance. There was no proof of a certain supply of water from the Aylesford springs. He believed there was no petition against the Aylesford plan upon the supposition that any one would be injured by it. He believed that nobody thought the scheme would pass, and therefore no one petitioned against it. He took the gauges on the 4th of November last, and they were filled in on the 6th. The supply of water at Tottington was 44,842 gallons in the twenty-four hours; Cussington, 255,499 gallons; Springhead, 73,944. He took a great many other gaugings. The gaugings on November 31 were—at Tottington, 186,854; Cussington, 310,296; and Springhead, 86,928 gallons.

Mr. CALVERT: Can you explain how it is that there is four times the quantity of water at Tottington on November the 30th than on November the 4th, while there is but a slight increase in the other springs?

Witness said it was a more variable spring. The gaugings were certainly not imperfect. He was there many hours, and took great pains in the matter. Tottington was variable; and no doubt it had rained in the meantime. He believed the latter part of November was rather a dry season. The Medway plan was rejected partly on account of the proposal for a rate, and partly on account of a dislike to the Medway water. The water at Plumpstead was softened to about eight degrees of hardness. Dr. Clarke's process would apply to all water coming out of chalk. The Plumpstead water contained sulphate of lime, which Dr. Clarke's process would not take out. The water, as coming from the chalk, was twenty-one degrees of hardness, and it was softened to eight degrees.

Re-examined by Mr. CLERK: He had found in practice that by driving an adit at the bottom of a well in which there was no water, a bountiful supply could often be obtained. It was possible to go below the line of saturation in chalk, and yet have no water, but by driving a tunnel laterally the fissures might be reached, and an abundant supply obtained. At Salisbury so much water was obtained in this way, that the men were obliged to leave as quickly as possible for fear of being drowned.

THURSDAY, JULY 14.

Wm. C. Milne, Esq., examined by Mr. CLERK.

I am the engineer of the New River Company, and have been much engaged in the construction of works for the supply of water to large towns, both in England and on the Continent. I have had great experience in schemes for supplying water from the chalk. I have examined the plan by which Mr. Homersham proposes to supply the town of Maidstone, and I approve of the same. I have also examined his estimates as to the cost of constructing the works, and I consider that they are sufficient for the purpose. From my experience and observation, I am able to say that water is to be obtained at a considerable elevation above Trinity high-water mark, according to the distance from the sea and the elevation of the land from which the water is obtained. In a well which is sunk at Cheshunt, a distance of fifteen miles from the Thames, the water stands 73 feet above high-water mark. The water is upheld by the resistance of the strata through which it passes, as well as by capillary attraction. The wells at Amwell Hill and Amwell End are sunk in the chalk, and one of them yields 2,850,000 gallons per day; the other, 1,500,000 gallons. The water in the one stands at 85 feet above Trinity high-water mark, and the other at 90 feet. They are within a mile and a half of each other, and though they are pumped at the same time, they are not affected. There is an abundance of water in the chalk. In cutting a tunnel on the Brighton Railway, a fissure in the chalk was tapped, which contained a large quantity of water. The pumping of the proposed well at Lidsing would not in any way affect the springs at Aylesford or Boxley, nor would the latter be injured if a bore-hole were sunk at Lidsing 250 feet below the well.

Cross-examined by Sir T. PHILLIPS: The fissures are often seen in chalk escarpments, and are frequently filled with earth from the top. I do not know whether there are any such fissures visible in the chalk escarpments on the Boxley range. Water, no doubt, flows a considerable distance in the direction in which there is the least resistance. The wells at Amwell are within 500 yards of the sea, and the water in them is almost on the same level, but they are in no way connected. As a general rule the pumping of large quantities of water has the effect of disturbing the equilibrium of the water-level by depressing it at that one point. I do not believe that pumping would have the effect of diminishing the supply of the Aylesford and Boxley springs, because of the great distance between the places, and also because of the nature of the strata, an uplift of gault preventing the water flowing in a southerly direction. The water which escapes at Aylesford and Boxley comes from the chalk.

By the CHAIRMAN: From my general knowledge of the chalk formation, I am able to say that a sufficient supply of water can be obtained at Lidsing.

By Mr. POWIS: I have formed a favourable opinion of the probable yield there from having heard it stated that the wells in the vicinity have never been known to be dry. I do not know that that is the case from my own knowledge.

Cross-examination continued: No experiments have been made at Lidsing further than the examination of the vicinity. I do not know the area which would be drawn from there, but sufficient to supply the water required. From my knowledge, which has extended over forty years, I am able, by an examination of the chalk strata, to know whether there is a probability of finding water at a particular point. If I found wells existing at a point at which I was going to seek for a supply of water, and found by inquiry on the spot that they have always water at the bottom, I should say, as a practical engineer, that those wells had reached the water-bed, if there was a considerable range of water surface. There is a large water-shed where Mr. Homersham proposes to sink his well. Between the Coln and the Lea there is a ridge of chalk, and if I were to sink in the upper part of that hill I should get water. In sinking wells to supply a town with water, I should do so as high as possible, so as to avoid having to raise the water afterwards. The position of the water in these wells is not at all affected by the state of the water in the river. There is no connexion between them, and therefore the water from the river never comes into the wells. The chalk is uniform in character, with the exception that the rubble chalk is deeper. My opinion is, that you may sink a well below a fissure which contains water without getting any water in that well, although at that point you are beneath the plane where the water is. If you were to run out a lateral adit, as proposed by Mr. Homersham, you would be able to tap an artery and get a plentiful supply. That is the system I have always adopted. If I were to find at Lidsing one or two wells which, though deeper than those proposed to be sunk by Mr. Homersham, contained no water, that circumstance would not indicate to me that he had not reached the water-level. I do not consider that in chalk you can find a water table. In the green sand the whole soil is saturated with water, and the water would stand very much on the same level in one part as another. At the Grenelle well in Paris, it is pretty much green sand. I do not know the depth. The water comes up at a high temperature—nearly boiling. In reference to this well, I think that if it were likely to affect the supply to persons three miles off, it would affect the springs and wells at Luton long before those on the south side of the hill. Supposing a spring three miles off to be affected, every other spring within that distance would be affected likewise. Taking a diameter of six miles, that would carry over a distance of twenty-eight square miles. That would be the area that would be affected. At that distance the uplift would entirely prevent it. This applies equally to the Boxley springs, which actually issue out of the chalk marl.

By the CHAIRMAN: The fissures in the chalk, which ultimately carry the water to the sea, are of different dimensions. I found my conviction that the wells at Lidsing will afford a permanent supply of water to Maidstone upon the amount of water shed upon the surface and the general indication of the land.

By the COMMITTEE: All the water at Lidsing is derived from the drainage of the surrounding surfaces. In the case of high chalk hills, where there is no possible drainage, the presence of water at the top is due to capillary attraction.

Mr. *Thomas Docwra*, examined by Mr. HOPE SCOTT.

I reside at Islington, and am a contractor. In the course of my business I have had a great deal to do with well-sinking in all sorts of strata—chalk, sandstone, gravel, &c., &c. I have been as much engaged in this sort of thing as any man in England; in fact, more so, and have sunk some of the largest wells in the kingdom. I have sunk a great many in the chalk. I sunk the wells which Mr. Milne spoke of, and others, at Croydon and Worthing, which were also in the chalk, as well as a great number in Hampshire. I consider that I have had experience enough to enable me to judge, from the look of the country, as to whether I can get water, and at what depth. The opinion I am able to form is one upon which I should be prepared to take works. I have examined the district from which Mr. Homersham proposes to get a supply of water for the Maidstone works; I have also examined the existing wells, and have gone into the details of the proposed scheme, and, in my judgment, those details are well adapted to the purpose. I consider that the estimate of Mr. Homersham is sufficient to enable him to carry out the works. I know the well at Salisbury referred to when this bill was in the House of Lords. That was not one of my sinking, but I have been to see it. The depth is 69 feet, and it is frequently short of water. With respect to the town of Salisbury, the wells there average from 5 to 40 feet, and there is not a well within half a mile of Salisbury above 100 feet deep; and, at a mile and a half distance, the deepest well that I could find was 143 feet deep. At the Druids' Head, Salisbury Plain, about a mile and a half from Stonehenge, there is a well 200 feet deep. It was 160 feet bore until within the last few years, when, being short of water, they sank 40 feet additional, and struck into the water. They have never been short since. There is another well close to Stonehenge which is 200 feet deep, and supplies a farm-house. These are the deepest wells near Salisbury Plain. I have never heard of any of the wells at Salisbury being without water, and formerly the town was entirely supplied from wells. In all chalk districts, when it comes a dry season such as we have had, the water will fall two or three feet—in some places more, and in others less. Supposing in this case the perpendicular bore does not produce enough water, it can be obtained in abundance by means of an adit, as we have done in Hertfordshire, so that when you are once down low enough you are sure to find water somewhere or other, depending upon the closeness of the chalk. I have been over the ground at Lidsing, and examined the nature of the chalk there. I do not see any difference in it to that of the chalk in a hundred other places, and I would guarantee that the company will find water there. I have seen something of the effect produced by wells being pumped near each other. In some districts they are not affected much by it. Taking the Aylesford springs, and knowing as I do the nature of the country, my opinion is that in this case no effect whatever would be produced.

Cross-examined by Sir T. PHILLIPS: The well at Croydon, to which I referred, is situated at a good distance from the Wandle; it may be half a mile. I have never taken the level at which the water stands in the well as compared with the river. When we had finished, the water ran over the surface of the ground. We cannot exhaust it below 18 feet; the pumps will not go any lower. The top of that well is not nearly at the bottom of the valley; it is on the side of the hill. I should say it is 10 feet above the bottom of the valley in point of actual elevation. The depth of water in the well below the Wandle is about 77 feet. There is no connexion between the river and the well. I do not know the elevation of the water at Worthing with regard to the sea level, as I have never taken it. The well is sunk 60 feet, and the bore is 280 feet, making a total depth of 340 feet. With reference to Salisbury, it is a fact that there are three considerable streams passing through the streets of the town. It was necessary to deepen the well there and also those in Hertfordshire, on account of the drought. Pumping will, of course, have the same effect at drought in diminishing the quantity of water. I have said that I would guarantee the supply of water at Lidsing; I have not entered into any arrangements of the kind, but I am prepared to do so. As far as the well is concerned, I should not sink any more, but I would extend the depth of the bore-hole. It would depend on circumstances how much; it might be 20, or 50, or 100 feet. I am not prepared to limit my extent of boring at the utmost to 100 feet below the 250. If I guaranteed to supply the water for a certain sum, I would not limit myself to any depth. Still I have no doubt there would be sufficient without boring. I would limit myself to nothing, but you may take it that 200 feet would be the utmost extent for 600,000 gallons per day. There are wells at Litsing already sunk. The one marked No 4 in the section is 414 feet, and had 3 feet 6 inches water in it in March of this year. At Bimble's farm, about 200 yards from Lidsing, the well is 255 feet deep, and has 37 feet of water. I cannot say whether that well was dry in October, 1858. When I went there for the purpose of ascertaining the probability of getting water, I did not make inquiry as to the supplying in that well. I went round and gauged these wells. Clinch's well is 300 to 400 yards from the proposed Lidsing works; it is 255 feet deep, and has 5 feet 6 inches of water in it. I should not be surprised to hear that there were only 2 feet of water in Johnson's well.

Re-examined by Mr. CLERK: If that well were only deepened a few feet, or an adit were run at the bottom, I have no question that the water would come in, and raise it to the same level as the one at the side of it. The effect of sinking a bore-hole is to keep the water in the well at the same level, and if allowed to carry the bore-hole down, I guarantee that the well need not be deeper than is proposed by Mr. Homersham.

By the CHAIRMAN: There is a possibility of getting a supply by means of an adit, without boring; but, as a practical man, I should not like to be bound to do it through adits.

Mr. *Frederick Haines*, examined by Mr. CLERK.

I am the superintendent of the Plumstead and Woolwich Water Company, and have been engaged as an engineer for several years. I am acquainted with the wells at Salisbury.

The CHAIRMAN: Need we go into that inquiry?

Mr. CLERK: An issue was raised in the House of Lords that those wells were failures; that they were sunk to a great depth in the chalk, and yet that they did not yield water. Mr. Hawksley was called on that occasion, and I have here the notes of his evidence, which certainly took us by surprise. We have now evidence to show that a large supply is given from the chalk at Salisbury.

Mr. POWIS: Can you prove the similarity of the chalk at Salisbury to this?

Mr. CLERK (to witness): What is the depth of the well?

The CHAIRMAN: Which well?

Mr. CLERK: At Salisbury.

The CHAIRMAN: I cannot understand this evidence at all. It is to contradict some statements which, as far as I can understand, has no reference here.

Mr. CLERK: One of the questions is, whether water can be found in the chalk formation at a certain level above the sea.

The CHAIRMAN: And Mr. Milne's evidence is that chalk varies very much.

Mr. DUTTON (to witness): Have you had any experience in the chalk?

Witness: Yes, at Witham and Salisbury.

Mr. DUTTON: And have you found that the chalk varies?

Witness: It varies, certainly; but not to any great extent.

The CHAIRMAN: At present there is *primâ facie* evidence on your part that water can be found here. If a contradiction should be hereafter given by a statement that the character of the chalk formation is such that it cannot be found, then we might be entitled to inquire what was done at Salisbury.

Mr. *George Clinch*, examined by Mr. CLERK.

I am a farmer, and reside at Lidsing. The well there, which is known as Clinch's well, is on my farm. There is always an abundant supply of water in it—generally from three to five feet. I find when a considerable quantity of water has been pumped out that the depth is diminished, but the water comes again next day. Last summer my neighbours used to come to get water out of my well, as some of the other wells, which were deeper than mine, were dry. I know Johnson's well; it is about fifteen or sixteen rods from mine, and people came from the neighbourhood of that well to mine to get water.

Cross-examined by Sir T. PHILLIPS: There are four wells in the neighbourhood of my farm. There is one on Wood's farm. I do not know whether it is deeper than mine, nor whether it was empty last October. They did not come to me from there for water. Bimble's people came to me for water as they cleaned out their well at that time. Johnson's well is much deeper than mine, and it was nearly dry last October. The water is drawn from my well by hand and bucket. I do not know how many sheep or cattle I could water, nor how many buckets a day I could draw without exhausting the well. We drew last summer for the steam-thrashing machine. It is an engine of about 8-horse power, and we can thrash about fifty quarters of wheat with it.

By the COMMITTEE: I have one or two cows on my farm, but no sheep.

Re-examined by Mr. CLERK: I have never known the well to be dry during the thirty years I have been there.

Mr. CLERK said it was proposed by the promoters to soften the water obtained at Lidsing by Dr. Clark's process, and he intended now to call that gentleman as a witness.

The CHAIRMAN said he did not understand that the merits of that process were disputed.

Sir T. PHILLIPS said they did not dispute that there were certain processes adopted by Dr. Clark that would soften water.

Mr. CLERK said the question really was whether water so softened would be beneficial.

The CHAIRMAN: That is not in dispute.

Mr. CLERK said there was one witness who he was anxious to call, and who would speak to the pressing want of water in Maidstone at the present moment.

The CHAIRMAN: That is not in dispute.

Mr. CLERK said possibly it was more urgent than honourable members were aware of.

The CHAIRMAN: I do not understand that it is at all disputed that Maidstone is in want of water. The question is whether your plan is the best plan for supplying that want.

Sir T. PHILLIPS said he understood that that was the case for the preamble of the bill, and he would now call witnesses in answer to that case. It would be more convenient to do so before addressing the committee, as they would thus have to listen to one speech only at the close of the case.

The CHAIRMAN said the committee would be glad to know upon what points the learned counsel proposed to call evidence.

Sir T. PHILLIPS said the substance of his evidence would be to prove that there was no certainty whatever of any water supply at Lidsing, and

that an abundant supply could be obtained elsewhere, and that the scheme was defective in all its details and ought not to be sanctioned by the Legislature. Insufficient supply, with entire uncertainty, inadequate arrangements by the promoters, and an abundant supply elsewhere, therefore, were the points. Of course, in addition to these, there was the question of special injury to individuals.

Mr. DUTTON said the question of whether an abundant supply could be obtained elsewhere, was no part of the question before the committee. It might be an interesting question next year, but at present he thought they had nothing to do with it.

Sir T. PHILLIPS said he hoped that, if it became necessary, the committee would hear him upon that point before deciding.

T. Hawksley, Esq., examined by Sir T. PHILLIPS.

I am a civil engineer, a member of the Institution of Civil Engineers, and one of the council of that body. My practice as an engineer has been largely directed to the construction and management of hydraulic works in many of the towns of England as well as abroad. I have been consulted as to the supply of water to a great number of towns, and amongst these are Liverpool, Nottingham, Coventry, Leicester, Sunderland, Newcastle, Lincoln, Boston, Norwich, Lowestoft, Birkenhead, Darlington, Leeds, Stockton, Derby, &c., in England; and abroad, Stockholm, Altona, and some of the West India islands. I have not only been employed in the original construction of such works, but I have also been connected with the management of them as consulting engineer.

By Mr. CALVERT: I gave evidence before the commission in 1848 in favour of the system of high-pressure constant supply, and my evidence before that commission was printed by order of the Government. I have been extensively engaged in the construction of pumping-works, and have sunk a great many shafts for the purpose of procuring water. I am therefore well acquainted with the mode of constructing such works. I have studied the conditions under which water may be obtained from chalk formations as well as from the green sand. I have special knowledge with regard to the supply of water to Maidstone, having been called in by the town authorities as far back as 1853, when the commissioners were desirous to undertake the supply of water themselves. I have also been consulted with reference to the supply of the adjacent towns of Chatham and Rochester. The reason why the supply of water to Maidstone has not been effected up to the present time is, that it has been made a party question in the town, and the commissioners have proposed to construct works by means of money borrowed upon the security of the public rates, and the ratepayers would never submit to a compulsory rate for the purpose. There is no difficulty in obtaining a supply; in fact, no place that I know of could so easily obtain it. The three great points to be secured are certainty of quantity, quality, and cheapness, and those three conditions can be secured by the spring-water scheme.

Mr. CLERK objected to this evidence as there was but one scheme before the committee. Whether water might or might not be procured from other sources he apprehended was not a question that they could go into; all they had to consider was whether Mr. Homersham's scheme was a proper one.

Mr. CALVERT said the opponents of the bill stated in their petition that other and better schemes had been proposed. Supposing the present scheme could be adopted for £20,000, and another scheme could be brought into operation for £10,000 or £5000, could it be suggested that the commissioners were not to take into consideration the great advantage of a cheap supply instead of a dear one. Or, on the other hand, if the plans of the promoters produced a supply of water of a moderate quality only, were not the committee at liberty to take into consideration evidence which indicated where water of a higher quality could be obtained. The question of the best supply was one of comparison, and the question here was, what could be of the greatest benefit to the inhabitants of Maidstone. That question could only be answered by the committee knowing what were the means of supply to be obtained in different quarters.

Mr. DUTTON said the learned counsel could not expect the committee to reject the present scheme on the faith that a better one might be put forward next session.

Mr. CALVERT said he appeared for certain petitioners.

Mr. DUTTON: You appeared as the advocate of a rival company before the House of Lords. Having been their advocate then, do you now shift your position?

Mr. CALVERT replied in the affirmative, and said he should submit to the committee that they ought not to adopt this scheme; because although there was no other bill before Parliament, there was a cheaper and more effective plan for supplying Maidstone with water. If he showed that this was a bad supply as compared with some other, and undertook to bring in a bill another year, he apprehended that would be an answer to the present case. The Maidstone people had within a stone's throw of them a good supply of water, which could be cheaply applied without going further for an uncertain supply. If the committee did not take that fact into consideration the town would be saddled with this company, which might prove the dearest and least advantageous to them. The question was not whether this company was to succeed or fail, but whether the town should have a proper supply of water. In the case of a railway, although there might not be a rival scheme before the Legislature, it was competent to show that a better line might be adopted.

Mr. CLERK submitted that the question was simply whether the allegations in the preamble of the bill were proved—viz., that Maidstone required water, and that a sufficient supply could be given by this company. If they went into any further inquiry than this, they might have Mr. Betts' springs set up as the best source of supply, or they might have evidence tendered that the Medway was better than all. It would then be for the promoters of this bill to go into fresh evidence to show the character of the water in the Medway, and how unfit it was for the purpose; they would also have to go into the question of the amount of water that could be got from the Aylesford springs, and what were the reasons which induced the House of Lords to reject that scheme. His learned friend had talked about the town of Maidstone being saddled with this company, as though if the bill passed they would be a burden upon the inhabitants. But it was nothing of the sort. If they obtained their Act, and were successful in procuring water at Lidsing, what burden would be thrown upon the inhabitants of Maidstone? If they were not, Mr. Betts could come forward next session, and get parliamentary sanction to his scheme. The only point was, whether the supply could be obtained at the point alleged by the promoters, and if it could they had proved their preamble, for that was all that it alleged. They did not dispute that there were other places in the neighbourhood, but whether they were cheaper or better or as good, could only be decided when the committee had heard the evidence in the case.

After some further conversation, the room was cleared, and the committee consulted for some time. On the doors being opened,

The CHAIRMAN said the committee have determined to limit the evidence to the question whether the plan proposed offers an abundant supply of pure water of which Maidstone stands in need, and that they will not enter into the superior merits of any other scheme.

Mr. *Hawksley* recalled, and examined by Mr. CALVERT.

I believe that the supply of water which is proposed to be obtained from Lidsing is not only uncertain, but that it is absolutely impossible to get it there either by wells or boring. If the proposed well only goes down 254 feet and there stops, it is absolutely impossible that there can be a supply. The first and most manifest reason for the opinion I thus hold is that that body of chalk is already penetrated in many places by wells of a much greater depth than 254 feet, and that the water-bed is not reached. In some of those wells it is true that a small quantity of water is obtained, but there is no permanent supply. That water goes away in dry weather; it is mere drip water. When the rain falls on the surface in this manner (describing upon a plan), it is quite immaterial which way the strata fall; if they are penetrated by wells like this, they form openings into which any water descending from the top will percolate by the sides, because they afford an easier course for the water, and, therefore, some water will drip in from the sides of these wells, and will be received at the bottom. If the water-bed is not reached, it may be that the water will escape again at the bottom, and the wells will become dry in some seasons, but generally there will be a little water in them, because of the great surface exposed to the drip. This water may be quite sufficient for the purpose of a farm, but is no supply for a town. [The witness, by reference to sections, pointed out the difference between the line of saturation and the line of water-bed.] The term, "line of saturation," is a misapplication; what is meant is the line of super-saturation—that is, the line at which there is more moisture than the chalk will hold, and it begins to fill up the fissures. At 20 feet below the point of saturation, you would not get at a spot from which you could hope to draw large quantities of water. You must not only go much below the line of saturation, but in this case must penetrate so far through the water-bed as to insure a sufficient surface being drawn from to supply the quantity of water wanted, viz., 800,000 gallons per day, because the drip going into that is all there is to supply it. The difference between a well and a bore-hole is this—a well makes a vacuum down to the bottom of it, and a bore-hole makes none. It only gives freer vent for the water by the removal of a portion of the resisting material, but it does not remove the pressure of the water which, by making a well, you do. In order to test the capability of obtaining a permanent supply, you must exhaust a quantity of water from time to time, in order to see whether, a large quantity being withdrawn, a similar large quantity will come in to supply its place. The mere boring does not tell what the supply would be. In this instance, judging from the evidence that many wells adjacent are empty, I should infer that there is no supply to be obtained for a town like Maidstone. Nor has the inclination of the strata in chalk anything to do with it. The well at Bredhurst, which is a very little distance from Lidsing, goes down a distance of 400 feet, and it has been, I am told, empty. The charges for the supply of water from the Lidsing well for the supply of the town must be very high on account of the depth they would have to sink it, the peculiarity of the stratum, and the great height the water would have to be raised, not only to reach the surface, but above the surface. The Aylesford springs would be very materially diminished in quantity by those works, supposing they were so constructed as to go down and draw water from the water-bed. If they produced no effect, it would be because they were not deep enough to get a large supply of water; so that the alternative is, they must either go down so low as to damage those springs, or not a sufficient distance to get an adequate supply of water. The Boxley springs, as well as the Aylesford, come out of the chalk; and the same remark as to damage would apply to the one as the other when there is a considerable supply of rain, but, in consequence of the drought of the last year or two, the Boxley springs are nearly run out. The Aylesford springs have also had a lower level through the drought, and partly in consequence of the construction of water-works at Luton, which are supplied from the same water-bed. The Boxley springs are now only just above the water-bed. A few years ago, to my knowledge, they produced 500,000 or 600,000 gallons per day; they now only produce from 60,000 to 70,000. Many small towns are supplied from chalk wells, but very few large ones, except under exceptional circumstances. I know of one or two in the immediate neighbourhood of the outfalls of large quantities of chalk-water—for instance, near the sea there are one or two. At Brighton, they get from 1,250,000 to 1,500,000 gallons per day, but that is not from a well sunk on the Downs. There have been several failures in endeavouring to supply towns from the chalk. There is the town of Southampton, where, after spending £50,000, they have been obliged to get a supply from the Itchen.

Mr. DUTTON: But is it not a fact that in laying their pipes to the Itchen they got a much better supply than they were looking for?

Witness: I should not be surprised to hear it. Nothing is more common in digging a ditch than to come upon a quantity of water, but it will not be a constant supply; it will run itself off, and there is an end of it. At St. Albans they had a very limited supply from the chalk. The Grenelle supply at Paris comes from the green sand. Before they came to that they tried the chalk, and obtained some water from it, but no considerable quantity. They then went through the chalk, and some clays and marls, to something more than 1800 feet. The wells at the London breweries are very irregular, and some go into the sand. Folkestone is a green-sand supply. The Act of Parliament was for a supply from the chalk; but it was found to be so limited that they have been obliged to perforate the green sand, which is a little below it. At Dover the supply is very limited. I was concerned for the corporation of Dover, and know that they have a much less quantity than they expected, and that they can only give a supply for twelve hours instead of twenty-four. There is not the slightest analogy between the supply at Plumstead and what may be expected from the Lidsing chalk. Plumstead well is put down in an exceedingly favourable situation, where the water is making its way from a great distance inland to its outlet in the Thames. [Witness described the relative positions on the map, and also the peculiarities of the Chiltern Range.]

By the COMMITTEE: The building of a water-tower would be a very expensive thing for a large town, and would involve a large annual cost in pumping the water up to that height.

By Mr. CALVERT: In the valley of the Colne the wells are near the water-bed of the district. It is not a question whether water stands so many feet above Trinity high-water mark, but whether the supply is resting upon the water-bed. Having considered the instances given by Mr. Homersham, I am still of opinion that there is no certainty of an abundant

supply of water to the town of Maidstone in the manner proposed by him.

Cross-examined by Mr. CLERK: I am not aware of the different elevations and the depth of the water-bed at different points in this district as laid down by Mr. Bland. I have stated positively that no water can be met with at Lidsing at the depth of 254 feet in sufficient quantities to supply a town. I have never in my life sunk a well in the chalk for the supply of a large town. I have gone through the process of driving lateral adits to get large supplies of water a great many times, but not in chalk. I always avoid the chalk, except where the water is near its outlet; because it is very uncertain about getting any considerable quantity, and it is never likely to exceed a few hundred thousand gallons per day. I certainly did, not long since, recommend sinking wells in the chalk for the supply of Brighton by the new company; and I told them that a million gallons a day was what they might expect in that district, but that was near the outlet. It was at the distance of about a mile and a half from the existing wells from which Brighton is now supplied, but in a very different valley. The Lidsing and Aylesford springs, however, are not in any valley at all. There is a continued escarpment which runs in this way [describing it on section]. When I proposed to sink a well in the chalk at Brighton, I did represent that sufficient quantities of water might be obtained to supply the whole town without interfering with the existing supply, and that is a fact. The present company raise from 1,250,000 to 1,500,000 gallons per day. The place where I proposed to sink the well was near the obvious outlet of the water from the chalk. In this case, between the top of the hill at Boxley and Lidsing, the water is making its way partly to the Medway and partly to the Thames. The water which is found at Luton and Plumstead is water that has made its way from the hills. I do not think it has passed Lidsing on its way. [Witness described the chalk range.] I was engaged for the commissioners in the Wirral water scheme, and gave evidence against the bill. At Liverpool the wells in the new red sandstone were affected at the distance of four miles. I did not say that the streams at Boxley were affected by the pumping of the water at Luton solely, but that since the well at Luton had been established, and partly in consequence of the continued drought, the springs at Boxley had almost ceased to flow. The supply at Folkestone was from natural springs flowing out of the chalk, and were geologically situated in the same way as Mr. Betts' at Boxley. I have not seen Mr. Robert Stephenson's report upon the subject of the supply of water to St. Albans, but I can state, from my own knowledge, that that town was inadequately supplied from the chalk.

Mr. CLERK: I think I understood you to say that the effect of sinking a well in chalk, or any other formation, is to draw the water from the adjoining area, varying more or less, I suppose, according to the nature of the rock or soil into which you drive your well, some soils being much more permeable than others? For instance, in the green sand a much larger area will be affected, because the soil is less permeable.

Witness: No; the more permeable the soil the smaller the area, because more water will sink down into the water-bearing portion, and there will be a less extent on the surface.

Mr. CLERK: But I am speaking of the underground flow of water. Supposing you sink a well in permeable strata, you will affect a much larger area?

Witness: Yes, if you can get the same quantity of water. If you sink a bore-hole it will not produce the same effect as a well. If you sink a well to a great depth, you will be enabled by the increased pressure to draw in a much larger quantity of water, and supposing in both cases that all the water that comes in is removed if you sink down to a considerable depth, the water will flow in from a large area. If you only make a bore-hole the water will only be eased in.

Re-examined by Mr. CALVERT: The similarity between Folkestone and Aylesford is geological only, not physical. The reason why I gave the opinion that the new well at Brighton would not affect the old was that they are in an entirely different valley, and the water comes from entirely different sides of the Downs. The valley I proposed to draw from is near Shoreham. When two wells in the chalk are sunk, if they do not reach the water-bed, they will necessarily affect each other. It is like having two taps in one barrel. This is the reason why some of the wells at Lidsing are much fuller than others.

The CHAIRMAN: Assuming that a well of 254 feet at Lidsing would be insufficient, would a bore of 200 feet be sufficient?

Witness: It would not; because it only affords greater facility for such water as can get to it.

The CHAIRMAN: If the well were perfectly water-tight, and the bore were sunk to a sufficient depth to force the water up?

Witness: Yes; it frequently happens when we go through impermeable strata, that the water will spout out of the bore. But where the strata is the same from top to bottom a different state of circumstances will arise.

Mr. *Frederick Braithwaite*, examined by Sir T. PHILLIPS.

I am a civil engineer, and have been for many years conversant with the sinking of wells. I have made the subject, in connexion with London and its neighbourhood, my express study. I believe I was the first person that drove tunnels in the chalk in search of water. The supply thus obtained is precarious, and is falling off every year. I find we have drawn 100 feet from London in the last thirty years. In 1827 a well was sunk at Messrs. Coomb's brewery in Long Acre. In 1846, hearing that a company was to be formed for sinking 100 wells in London, I wrote a paper on the subject, in which I warned capitalists not to invest money in the undertaking, and I said that this well of Coomb's would be dry in ten years. It was dry in 1857. With regard to the sand formation, thirty years ago all the sand under London was full of water; but all the wells which we sunk there have become dry in the higher levels, and are becoming so in the lower. I do not know any instance in which the supply has not been diminished. From my general knowledge of the chalk district, from information derived from persons in the neighbourhood, and from the fact of finding so many of the wells in the locality of different depths with an uncertain quantity of water, I am perfectly satisfied that an adequate supply of water for Maidstone cannot be obtained from Lidsing. Mr. Homersham's estimate of 750,000 gallons per day from the borings at Redbourne is not correct.

Cross-examined by Mr. HOPE SCOTT: The well at Coomb's is 522 feet below Trinity high-water mark. It is 230 feet from the surface of the land to the chalk, and nearly 200 feet through the chalk. It produces very little water now. There is a deeper well than that at Meux's brewery, and also I think in Trafalgar Square. At Meux's we bored down 400 feet, and the yield of water is about 40 gallons per minute. The Orange Street well is about 184 feet to the sand, and the total depth 300 feet. There is a great deal of water there from the sand, but very little from the chalk. The water is so sandy that they have been obliged to stop up one well. The quantity of water which is there obtained from the chalk through the bore-hole is perhaps 50 gallons per minute. This well, the bottom of which is lower than Coomb's, has affected their well. [Witness was interrogated as to several other metropolitan wells.] The chalk under London is compressed and hardened by the sand and clay above it, and in that respect is no doubt different to the chalk in other parts of the country. It retains the characteristic of chalk, of having fissures in it, though there is a less tendency to it than in other parts. It is not less permeable by water.

Re-examined by Sir T. PHILLIPS: My experience goes to prove that the supply from chalk is very uncertain. The supply is temporary, and is constantly diminishing. I know the quality of the water in Pickford's and the North Western Railway Company's well. There is no carbonate of lime in it, but 44 grains of sea salt. They cannot use the water for their boilers.

FRIDAY, JULY 15.

Mr. CLERK asked permission to call Mr. Paton as a witness for the promoters. At the last sitting, Mr. Braithwaite said that the statements made by Mr. Homersham, as to some borings at Redbourne, were not correct. Mr. Paton was the person who sank those wells, and knew accurately what was the quantity they yielded. It was a mere question of fact.

Mr. *R. M. Paton*, examined by Mr. CLERK.

I am a contractor and well-sinker. I superintended the sinking of five borings at Redbourne in Hertfordshire, near St. Albans, and I have gauged the overflows from them with Mr. Homersham. The quantity yielded by those five borings is about 750,000 gallons per day.

Cross-examined by Sir T. PHILLIPS: We gauged them several times; I was not with Mr. Braithwaite when he gauged the borings separately. He was down there gauging the river and the borings. I did not know that he did it for the purpose of knowing how much water was from the river and how much from the chalk. I do not know that the borings were shut down in order to ascertain it. He gauged the river and borings together. I am not aware that his gaugings showed that the quantity due to the borings was only 370,000 gallons per day.

By the COMMITTEE: I do not consider that those borings have injured any of the streams in the neighbourhood. The stream which ran from Markyate Street does not run now. I do not know what has become of the stream which ran from Church End, but I do not imagine that these borings have anything to do with them.

By Sir T. PHILLIPS: The distance of the borings from the river is twenty yards. The stratum through which they are dug is chalk.

Re-examined by Mr. CLERK: I gauged each boring separately to see what each would yield, and adding the products together they amounted to 750,000 gallons. The quantity of the water in the river was also gauged, but the 750,000 gallons were entirely from the borings. In consequence of the long drought surface streams from the chalk have almost disappeared, but those sunk in the chalk remain undiminished.

By the CHAIRMAN: The water from three of the borings is conveyed into the bed of the river. When I gauged one of the borings I stopped the others

By Mr. CLERK: We gauged them by making a weir at the end of each boring. In some cases the other borings were running when we were gauging one, and sometimes they were stopped, but it did not make the least difference.

Mr. *Robert Tiffin*, an engineer, in the employ of Sir Samuel Morton Peto, produced a plan of the locality of the proposed works, shewing the situation of the existing wells, &c., and was examined at length as to their depths, and the result of gaugings by him in February and June last, proving that the supply of water in them was very limited and variable.

Mr. *James Pilbrow*, examined by Sir T. PHILLIPS.

I am the engineer of the Luton Works. I have executed works for supplying water to several towns—viz., Watford, Tottenham, Enfield, Uxbridge, Brompton, and Gillingham, all from the chalk. The latter are situated at Luton, about two and a half miles from Lidsing as the crow flies, and at the junction of the two valleys in the direction of the north-eastern outfall of the chalk formation of the North Downs. The distance from the Medway and Chatham is about one mile and a quarter. Our well at the foot of the range of hills is at the surface less than eighty feet above the mean tide level. The well proper is seventy feet deep with adits. The water bed is fifty-six feet from the surface of the ground. Supposing that line to be continued in the direction of Lidsing, if the water rested in the same angle as in the well at Luton, I consider that they would have to bore 267 feet below the bottom of their well to get to the level of mine. That is assuming the curve to continue as I find it to exist between me and the Medway. They would, therefore, have to go this 267 feet lower than the 254 which they propose in order to get a supply of water. And going by boring alone would not do; they must sink their shaft 117 feet in order to place their engine. At Luton we are upon the same chalk range, distant about two miles from Lidsing, and the inclination of the stratification, as well as the pressure of the water, is towards us, while at Lidsing they are very nearly at the top of the chalk range. The quantity of water which I am able to provide is 300,000 gallons per day. If necessary to increase that quantity, I must extend my works still lower or spread them out. Most likely I should find it necessary to do both. The surface of the water in my well was orignally 25 feet above the mean water level of the river. It is not quite so high now, but is rising again. After a day's pumping, the water stands about 11 feet 6 inches above the tide level. The water recovers itself by the next morning. If the proposed works at Lidsing stop at 254 feet, they will have no means of supplying Maidstone with water from there. It would be impossible for them to have more water than a common hand pump would exhaust. Before you get any large quantity of water in the chalk, you must go down to the water-bed; there are no other means of getting it. I have no doubt that the water in the existing wells at Lidsing is that which has dripped or percolated into them. Any supply from fissures in the chalk would be only temporary, depending for continuance upon the size of the fissure. If they presented a large surface for percolation, it might be some time before they were exhausted. There is no certainty of supply until you get down to the real water-bed, a long way below the level of water mark. In estimating that they would have to go 367 feet lower at Lidsing, I have allowed for 60 feet of probable fall. The cost of the works would not be so largely increased by the extra sinking in chalk, but the pumping up of the water would be a large annual expense. If a supply could be obtained in the way proposed, the effect would be, if my theory is true, to attract the water from the whole strata and lessen the quantity at the outfall. Mr. Betts' springs and the Boxley springs would be affected in the same way.

By the COMMITTEE: In my opinion, the sinking of my well at Luton has not done damage to neighbouring wells. I fix the level of the water-bed much lower than Mr. Homersham does. The Luton well is in a very favourable position. I have supplied towns similar in situation to Maidstone, but I never went to the top of a hill for water when I could get it in a valley. I cannot imagine a case in which it would be necessary to do so. I have never had to commence a boring at such an elevation as this.

By Sir T. PHILLIPS: I am engineer to the Watford Water-Works, and from my experience I should say that there is no analogy at all, as suggested by Mr. Homersham, between the Coln or the Amwell and Lidsing. In the former cases the chalk is saturated with the river.

Cross-examined by Mr. CLERK: As a matter of fact, the water-bed is sometimes high up in a hill, if it is a great distance from the sea. The exact distance from the proposed well at Lidsing and the Medway is four miles at the nearest point. Assuming that the water flows in that direction, and that the strata dips that way also, the inclination of the water-bed would be, I should say from my experience, about 30 feet per mile. I am not aware that Mr. Prestwich puts it at 47 feet per mile. At my estimate of 30 feet per mile, it would give 75 feet higher at Lidsing than at Luton, making the water-bed at this point just 100 feet above the level of the Medway.

Mr. CLERK: As the bottom of the proposed well at Lidsing is, as you have heard, 140 feet above Trinity high-water mark, according to your calculation there would therefore be 40 feet to go from the bottom of this well?

Witness: Yes; but in order to get a sufficient supply you must drive adits, and adits are no use until you get to the water-bed. In my well we go down perpendicularly after we reach the surface of the water. I was the engineer of a rival scheme last year, for supplying Maidstone. The requisite notices were given, but it dropped through. My scheme was different to either of these. It was not for getting water from chalk. At Watford, the water stands at 169 feet above the level of the sea. We pump about 200,000 gallons per day there, and lower our well in pumping that quantity 3 or 4 feet. At Uxbridge, we pump 300,000 gallons per day. Neither of these wells has at all affected the other wells in the neighbourhood, and there are some within half a dozen or a dozen yards of them. It entirely depends upon the density of the chalk itself whether the extent to which neighbouring wells are affected is in the ratio of the distance from the place of pumping.

Re-examined by Sir T. PHILLIPS: The whole of the strata at Watford may be regarded as one well; it is completely saturated with water. So far as I know, there was never such a scheme as this proposed for supplying a large town from the top of a high chalk hill. It would be necessary to continue these works to within 15 feet of the distance I first gave, in order to obtain a proper supply.

George Bidder, Esq., examined by Sir T. PHILLIPS.

I am a civil engineer, and having been connected with railways for many years I have had the means of forming an opinion of the propriety of schemes for supplying towns with water. I am acquainted with Maidstone and Lidsing, and the North Downs. I know that on the southern side of those Downs Mr. Betts resides, and has there a considerable property. There is a very large escape of water from those Downs—I should say from the gaugings with which I have been supplied about 600,000 gallons per day. Looking at the sections and assuming them to be correct, I should say that the sinking of the proposed new well to a depth of 254 feet from the surface will certainly not intercept the water-bed, and there is not the least doubt that such a well at Lidsing would not yield an adequate supply of water for Maidstone. Water may be procured in the neighbourhood conveniently and cheaply, I should say at half this cost of construction and at half the working expenses. I think they would have to go 250 feet lower, not to get to the water-bed, but to get a sufficient pressure to insure a supply. The water-bed itself being a variable level, they would get no sufficient pressure by simply sinking down to it, and then by pumping they would lower it. I think this scheme must end in disappointment to the people of Maidstone, and in delay in maturing an adequate scheme.

Cross-examined by Mr. CLERK: I have sunk wells in chalk, but not for a large supply of water. Considerable quantities of water may be met with in chalk at a great elevation above the sea. I was not engaged upon the Brighton Railway, but I know that in constructing the Merstham tunnel on that line they came upon a large bed of water about 300 feet above the sea. I was engaged with Mr. Stephenson upon the Birmingham railway, and I know that in the Tring cutting we came upon a quantity of water. That is 400 feet above the sea, and is the highest point on the railway, and is situated on the summit of the chalk ridge. It forms very nearly the rim of the basin where we found the water. I do not know that it could only be supplied with water which fell in the immediate neighbourhood. I cannot say whether it yielded upwards of a million gallons a day. I know I gauged it, but I cannot remember what it was. The cutting was made in the years 1834, 1835, and 1836; its depth is about sixty or seventy feet. I do not recollect at what depth we came to the water, nor how long it continued to run.

Mr. CAVENDISH: I should like to know whether the chalk in the Tring cutting, and the tunnel at Merstham and at Lidsing, are the same sort.

Witness: I should think the chalk is more solid at Merstham. But there is no analogy between those places and Lidsing.

Mr. CAVENDISH: Do I understand from your answer that at Tring and Merstham you are much more likely to find water than at Lidsing?

Witness: Yes.

Mr. *Beardmore*, examined by Sir T. PHILLIPS.

I am an engineer, and have had considerable acquaintance with the chalk formation and the streams which flow from that formation. I have inspected the site of the proposed works at Lidsing, and also the Aylesford springs. The aggregate supply from the latter is 600,000 gallons per day. In my opinion the construction of the well at Lidsing, if it was carried to a depth sufficient to insure a supply of water, would imperil those springs. I cannot see any chance of a sufficient supply of water being obtained if the well is only sunk 254 feet. The upper part of the hill has always appeared to me to be very porous, and that would indicate that the water must be at a considerable depth. The area which supplies the Aylesford springs is common to that which supplies the wells at Lidsing. Assuming that 800,000 gallons could obtained at Lidsing, the natural discharge at the present outfall must be necessarily affected. There is no analogy between these and the Amwell springs. The Amwell wells for all practical purposes may be considered as placed in the middle of the finest springs in England, perhaps in the world. The New River Company were very hard up for water when they sunk these wells. About four or five years ago, I had occasion to see whether these wells were pumping from the springs, and I found that they reduced the springs the moment the engines were stopped. The wells are placed in a water-bed from a half to three-quarters of a mile wide, and running from three to five miles long, abounding in springs in every direction, and which boil up to the surface. The nearest of them is seventeen miles from the Thames. I know of no case in which a water engineer having water flowing out of the bottom of a hill has gone to the top and pumped it up. I should think it was very inexpedient to sanction this scheme for supplying Maidstone with water.

Cross-examined by Mr. CLERK: I spoke of this as a well proposed to be sunk on the top of a hill, but I am aware that a small quantity of country rises 222 feet above that spot. A considerable variation in springs is a strong indication that they are superficial; but all chalk springs vary, and at the present season they are very low. I do not know what is the inclination of the water-bed in the chalk downs about Maidstone, rising from the estuary in the Medway. I should think it is not so much as 45 feet in a mile. In Hertfordshire it appears to be about 12 feet. The case may happen that in driving a well in chalk, you may go below the water-bed, and then, by driving an adit, you may get into it. I should think the pumping at Luton and Boxley would only very slightly affect the Lidsing springs. The Amwell Hill well affected the springs of which I spoke. Those springs issue out of the chalk through a small quantity of gravel. I do not know that an iron cylinder was put down in the well to keep out the water from the gravel, and that the effect of that was to shut off the water from the springs. The Amwell River well is 1500 feet from the Amwell springs, the other is 500 feet. The Amwell Hill well is on the side of the hill, 1500 feet above the springs.

Re-examined by Mr. CALVERT: I said it was possible to pass below the water-bed in the chalk without finding water. The reason is that the fissures in the chalk, which I believe originally are faults, are excessively capricious. I would not undertake a great and expensive work, relying upon any speculation of that kind, to supply a town.

By the COMMITTEE: The distance of Mr. Betts' springs from the proposed well is about three miles. I think the sinking of that well would affect those springs if it is to be pumped. The level of those springs, as compared with the bottom of this well, is 40 feet. The water to supply them comes from the chalk hills. There is a bed of gault underneath. The level of those springs is 290 feet from the surface of the ground. The water-shed undergrounnd to supply springs must be very different from the natural contour of the ground, and must extend above it for some distance. There must be a good deal of water in the chalk hill.

Joseph Gibbs, Esq., examined by Mr. CALVERT.

I am a civil engineer, and have had great experience in hydraulic works and drainage of every description. I was examined on the metropolis water scheme a few years ago. I am acquainted with the Lidsing springs. Supposing works were constructed there, and carried deep enough to supply 800,000 gallons per day, the effect would be that the water equilibrium would be disturbed, and it must be injurious to the whole of the springs in the neighbourhood. According to the data we have, they would not get any available supply of water for the town of Maidstone at a depth of 254 feet. They would get water, but only what might filter through the adit. There would be no hydrostatic pressure at all, because the adits are not put below the water-level, and it is a matter of vital importance that you should sink so low that the adit should have a hydrostatic pressure from above all round. The height above Trinity high-water mark is of no importance in this question.

Cross-examined by Mr. CLERK: It depends upon the area of the watershed as to the height of the water-level, and also upon the porosity of the material through which the water passes. I know all the springs in the neighbourhood. I consider that undoubtedly the Boxley springs are fed from the water-bed. I do not know the height of those springs above the level of the sea; perhaps they are 60 feet. I am sure that the wells at Lidsing do not reach the water-bed, and therefore that the adits will be dry.

E. L. Betts, Esq., examined by Mr. CALVERT.

In 1847 I purchased the Preston Hall estate from Colonel Milner. I afterwards purchased some adjoining property, and I have now some 3600 or 3700 acres of land there. I have also some springs at Aylesford. When I heard of the Lidsing plan for supplying Maidstone, I consulted an engineer to know whether it would do me harm, and I was told that if the well was sunk 250 feet only it would not. After the bill passed the House of Lords, I had some negotiations with the promoters of the plan to prevent further struggle. [The correspondence was put in and read.] The quantity of water that comes from my springs at the present time is 600,000 gallons a day. That is the ordinary flow now, and it has not varied for many months.

Cross-examined by Mr. CLERK: I was not with Mr. Homersham when he gauged the wells. I have resided at Preston Hall for the last twelve years. I was never present at a meeting in Maidstone when the water supply was discussed. It was in the month of November last that I first put forward my springs for the supply of Maidstone. A day or two after I saw Mr. Mercer. I consulted an engineer before I knew that they would not take my springs. My impression is that no water will be procured at the distance they propose to go. I offered to withdraw my opposition if clauses were inserted in the bill preventing the company from sinking their wells or adits lower than the depth stated upon the deposited plans. I am very desirous that Maidstone should be supplied with water, but I believe this scheme would end in disappointment.

Re-examined by Mr. CALVERT: If I had withdrawn my opposition it would not have been because I approved of the bill, but because I believed that with the restriction as to depth, the well would have done no harm to my springs.

By Mr. DUTTON: I have no house property in Maidstone. It was on the 8th November I first heard of the Lidsing scheme, and within three or four days of that time I consulted an engineer upon the subject.

Mr. *John Large*, Mr. *Thomas Potts*, and Mr. *William West*, (millers), were examined to prove that the water supply at Lidsing was yearly diminishing in quantity.

Mr. *Prestwich*, examined by Mr. CALVERT.

I am a fellow of the Royal Society, a member of the Geological Society of France, and the author of a work on the geological character of the water bearing strata of England. I have surveyed the strata at Lidsing with reference to this inquiry. I think at a depth of 254 feet from the surface the supply of water would be extremely small. The wells in that area are sunk to a depth of 200 or 300 feet, and they are invariably stopped when a sufficient supply of water has been obtained for domestic purposes, which they could procure at that depth. In order to get a supply for a town I should say you must go not less than from 60 to 100 or 150 feet lower.

Mr. CALVERT: What do you say to the chalk as a water-bearing formation?

Witness: It is not very favourable. It is true that chalk will absorb a very large quantity of water, as much as two gallons per cubic foot, but that water will not be given out again. I believe that if the promoters of this bill go an additional 150 feet lower they will affect the springs at Aylesford. These springs are exclusively supplied from the same area

Cross-examined by Mr. CLERK: The Boxley springs are also supplied from the same area. Their height above the level of the sea is more than 200 feet, I have put the inclination of the water table in this district at forty-seven feet in a mile upon the average, taking the distance from the river Thames to the apex of the hill. The higher you go up that inclined plane, the less the supply of water must necessarily be.

Mr. CALVERT then addressed the committee. He said he thought the opponents of the bill had produced sufficient evidence from practical men to show that the whole scheme of the proposed works at Lidsing was illusory, and he entertained a very strong opinion that if that evidence had been laid before another tribunal a different decision would have been come to. On the part of the promoters there had been no direct evidence given that an adequate supply of water could be obtained; it was all speculation, and the committee would observe that the existing wells, as shown on the section, afforded no indication that such a result would be secured. On the contrary, the proof was that there was no water in the place, because, as they had heard over and over again, that if these wells had gone down to the water-bed they would have been of uniform depth, and there would have been an uniform supply of water in each. The case of the promoters had also failed on the analogies they had attempted to establish, for in all the instances which were cited, the water supply was resting upon the level of the water-bed of the district. These, therefore, afforded no criterion when they came to deal with Lidsing. After referring at length to the evidence of Mr. Homersham, and weighing it against the testimony of Mr. Pilbrow, the learned counsel proceeded to urge that the promoters of the bill clearly distrusted their own case. In the House of Lords nothing at all was heard about going down below the 254 feet; and Mr. Homersham, when examined by his own counsel, expressed no doubt of being able to get what water he wanted there. In the interval between the proceedings in the House of Lords and the present inquiry, the correspondence which he had read took place between Mr. Betts and Mr. Mercer, and that correspondence was founded upon a request that a clause should be inserted in the bill binding the undertakers not to go below the depth stated in their deposited plans. But although the promoters refused to give Mr. Betts that clause, there was no doubt expressed that at that depth they would not get a supply of water. And yet now, when they came before the House of Commons, they first asked to go five feet lower, then twenty, then fifty, and Mr. Homersham subsequently stated that he wanted power to go down to any depth he pleased until he procured the quantity of water he found it necessary to supply. The committee would, he was sure, be of opinion that the full extent should have been stated at the first, so that all parties interested would have had the opportunity of seeing and judging how far they would be affected by the scheme. All these matters should be matters of plain certainty to the community at large, and the parties specially interested in protecting their rights, and the sections lodged in Parliament should be sections from which there should be no departure. Of course if the promoters put their well down double the distance, the cost of the works must be very much greater than the original estimates, and the annual cost for pumping must be correspondingly increased. The scheme, therefore, was one of a very different description to that which was originally submitted to the Legislature, and though the other House might sanction a well of 250 feet, it by no means followed that a similar preference would have been shown for one of double that depth, especially when it could be shown that though the former would have no effect upon the neighbouring springs, the latter would most seriously damage them. The difficulty the promoters were in was this—they could not obtain the water they required by sinking a well to the depth first proposed, and a boring to the present depth would not answer the purpose, because that would only bring the water up to the level of the water-bed. It was not only necessary to go to the margin of the water-bed, but so much below it as would insure a sufficient surface to enable them to gather all the water they required, and if they were permitted to do this the evidence showed that the neighbouring wells would be imperilled. Without touching upon what he might call the smaller parts of the case, he submitted to the committee that the plan entirely failed upon the main points. He left it, therefore, with confidence to their decision, merely observing that nothing could be more detrimental to Maidstone than that this or any other scheme should be sanctioned which did not offer with positive certainty an abundant supply of good water. The consequence of passing this bill would be, that for two or three years the company would go on making efforts to avoid publishing their failure, and that until that failure was actually confessed, the town must be kept without an adequate supply. Under these circumstances, and without reference to opportunities which might be afforded for obtaining that supply in the immediate neighbourhood, the committee, he thought, could come to no other conclusion than that by this scheme, as proposed, there was no certainty in the matter whatever, while to allow them to depart from the plan they originally deposited, was most unfair to the people of Maidstone and the owners of the adjoining wells. He therefore hoped they would be of opinion that the preamble of the bill was not proved.

Mr. HOPE SCOTT replied: After referring to the pressing want of water in the town of Maidstone, to the efforts which had been made from time to time to secure that supply, and to Mr. Betts' rival scheme which was defeated in the House of Lords, he proceeded to comment upon the way in which the opposition to the present bill had been conducted. After hearing the evidence on both sides, this question, he said, remained behind, that the chalk country did afford water in considerable quantities, and that whole towns were supplied from it. The *onus probandi*, therefore, rested upon the opponents of this scheme, to show that the quantity which could be obtained at Lidsing was insufficient. What was the evidence on this point? They could not doubt that the chalk did supply water abundantly to the New River, to Brighton, to Croydon, and various other places. And why not here? Why, against this general experience, should the opponents of the bill say that water was not to be had at Lidsing? On the question how the water was to be got at was another question, but that it was to be found there, remained beyond all power of dispute. Was not the range of country large enough to afford a sufficient area? It extended for miles. Was the chalk different to that which was found in other places? There was not a particle of evidence to show that it was. It was loose chalk above, a harder closer chalk below, with the characteristic fissures which the chalk ordinarily presented. It, moreover, had a large rainfall over it. Then why on earth, unless science was to be brought forward to contradict common sense, was no water to be had here? Of course science was brought forward on this occasion, and practical men had been produced on the other side. But of these, Mr. Pilbrow alone had sunk a well to any extent in the chalk, while on the other hand Mr. Milne, Mr. Docwra, and Mr. Paton had been called, each of whom had had immense experience in such operations. After referring to the testimony of these gentlemen and the evidence as to the geological character of the district, the learned counsel submitted that by the plan proposed by Mr. Homersham, it was clear that an adequate supply of water would be obtained. But even supposing they should fail, what damage would be done to any one? The company were not going to rate the inhabitants to carry out their scheme; it was a private venture of their own, and it certainly seemed to be as probable a scheme as any other. It was not to be a public risk, but a Private one, and the shareholders in it were content to take the risk. But then it was said Mr. Betts' springs would be injured, which in other words meant that Mr. Betts wanted to have another chance in Parliament. Mr. Betts had proposed to insert a clause in this bill, limiting the promoters so that they should not sink their well lower than 250 feet. They objected to such a clause because they saw that it was intended to cripple their proceedings, and though at that depth they should happen to be within two or three feet of a fissure, to prevent them from taking advantage of their position, although Mr. Betts' wells were as safe as any others in the county. If the committee would look again at the plan they would see that the stratification was falling towards the sea, and the direction of the discharge was the same; why, then, should they expect that in Mr. Betts' case water should reverse its law and run up hill? Their own witnesses had put it that the water was going down at the rate of forty-seven feet per mile; the company were proposing to pump at a level at which they said they could hit that inclination, but how could they possibly hurt Mr. Betts' well when the water they proposed to take was that which was flowing away from him? And the committee would also remember that there was another point, upon which there was a perfect accord between all parties, viz., that a bore-hole below the well would not affect any neighbouring spring—that the bore-hole would always stand full of water, that there would be no vacuum, but the water would be continually surging up into the well. The bore-hole, therefore, might take the place of additional depth of well, and in that way Mr. Docwra had stated he would undertake to get the quantity of water required. In conclusion, he called attention to the fact that although it was said the Boxley springs would be similarly affected, the owners of those springs were quite content to take their chance, and had not appeared before the Legislature to oppose the present bill.

The room was then cleared, and the committee remained in consultation for about half-an-hour. On the doors being opened,

The CHAIRMAN said: The committee have decided that the preamble is not proved.

A BILL INTITULED AN ACT FOR REGULATING MEASURES USED IN SALES OF GAS

(As amended on Report.)

Whereas it is expedient that the measurement used in sales of gas for lighting, heating, and other purposes, should be hereafter regulated by one uniform standard, and that all meters should be stamped as hereinafter provided: Be it therefore enacted by the Queen's Most Excellent Majesty, by and with the advice and consent of the Lords spiritual and temporal, and Commons, in this present Parliament assembled, and by the authority of the same, as follows:

I. In construing this Act, the word "meter" shall mean gas-meter, and shall include every kind of machine used for measuring gas; and the word "person" shall include corporations.

II. After the passing of this Act, the only legal standard or unit of measure for the sale of gas by meter shall be the cubic foot containing 62·321 pounds avoirdupois weight of distilled or rain water, weighted in air at the temperature of 62° of Fahrenheit's thermometer, the barometer being at 30 inches, except as relates to contracts made before the passing of this Act, by which a different unit or measure is adopted, which contracts may not be renewed.

III. Within three months next after the passing of this Act, models of gasholders measuring the said cubic foot, and such multiples and decimal parts of the said cubic foot as the Lord High Treasurer or the Commissioners of Her Majesty's Treasury of the United Kingdom for the time being shall judge expedient; and from time to time after the expiration of the aforesaid period of three months, models of such further multiples and decimal parts of the said cubic foot as the Lord High Treasurer or the said Commissioners shall from time to time think expedient, shall be carefully made, with proper balances, indices, and apparatus for testing the measurement and registration of meters, and such models shall be verified under the direction of the Lord High Treasurer or the said Commissioners; and, when so made and verified, shall be deposited in the office of the Chamberlain of the Exchequer at Westminster; and copies of the models so from time to time deposited, verified as aforesaid, shall be sent to the Lord Mayor of London and the chief magistrate of Edinburgh and Dublin, and to the chief magistrate of such other cities, and to such other places and persons in Her Majesty's dominions, as the said Lord High Treasurer, or the aforesaid Commissioners, may from time to time direct; and the said Lord High Treasurer or the said Commissioners shall appoint a competent person or persons to design and make, subject to the approval and by direction of such Lord High Treasurer or the said Commissioners, stamps of a uniform design to be used for stamping meters throughout the United Kingdom, with only such variations of numbers or marks thereon as shall be sufficient to distinguish each inspector's district.

IV. In England at the general or quarter sessions of the peace next after the passing of this Act, the justices of the peace of every county, riding, or division, or county of a city or county of a town, in general or quarter sessions assembled, and in Scotland the justices of the peace at a meeting to be called for the purpose by the sheriff of each county, and the magistrates of each royal borough, within three months after the passing of this Act, and so from time to time at any subsequent general or quarter sessions or meeting so called, shall determine the number of copies of the said models of gasholders, with proper balances, indices, and apparatus as aforesaid, which they shall deem requisite for the testing of meters within their respective jurisdictions, and shall direct that such copies, verified and stamped at the Exchequer, together with such number of stamps for stamping meters as they shall deem requisite, shall be provided for the use of the same, and shall fix the places at which such copies and stamps shall be deposited; and shall appoint a sufficient number of inspectors of meters for the safe custody of such copies and stamps, and for the discharge of the other duties hereinafter mentioned, and shall allot to each inspector a separate district, and from time to time, when necessary, shall subdivide and re-allot such districts, and all such districts shall be distinguished by the number or mark applied thereto on such stamps; and they shall direct what reasonable remuneration shall be paid to such inspectors for the discharge of such duties as they shall have been ordered by such justices or magistrates as aforesaid to perform; and they are hereby empowered to suspend or dismiss any inspectors so appointed, or to appoint additional inspectors as occasion may require: Provided always, that nothing herein contained shall extend to compel any royal borough of Scotland, except such as are county towns, wherein gas is used, to provide copies of the said models and stamps, or to appoint an inspector or inspectors for the performance of the duties prescribed by this Act; and that it shall be lawful for the justices of the peace in any county, and for the magistrates of any royal borough within such county, where they shall agree, to unite the whole or a portion of the county with such royal borough, and to ap-

point one inspector therefor, and to provide at their joint expense copies of the said models and stamps to be used within such united districts.

V. In Ireland the grand jury of every county, county of a city, or county of a town, shall at the assizes, or where no assizes are held, at the presenting term next ensuing after the passing of this Act, and so from time to time at any subsequent assizes or presenting term, determine the number of copies of the said models of gasholders, with proper balances, indices, and apparatus as aforesaid, which they shall deem requisite for the testing of meters within their counties, counties of cities, or counties of towns respectively, and shall direct that such copies, verified and stamped at the Exchequer, shall be provided for the use of the same, and shall fix the places at which such copies shall be deposited, and shall appoint a sufficient number of inspectors of meters for the safe custody of such copies, and for the discharge of the other duties hereinafter mentioned; and shall allot to each inspector a separate district, and from time to time, when necessary, shall subdivide and re-allot such districts, and shall direct what reasonable remuneration shall be paid to such inspectors; and they are hereby empowered to suspend or dismiss any inspector so appointed, or to appoint additional inspectors from time to time as occasion may require.

VI. In Ireland the senior judge shall, before the close of the assizes next ensuing, inquire whether one such copy has been provided in each county, county of a city or county of a town, where gas is used; and in every case in which it shall not appear to him that such copy has been provided, such judge shall forthwith order the treasurer of the county, county of a city or county of a town, to provide one such copy, and every such order shall have the effect of a presentment on the county at large for such sum as may be necessary to procure such copy; and such treasurer shall, within three calendar months next after he shall receive such order, fully execute the same, or failing so to do, shall forfeit the sum of twenty pounds sterling.

VII. The copies of the said models so directed by the said justices, magistrates, grand juries, or senior judge, to be verified and stamped at the Exchequer, shall be compared with the models deposited with the Chamberlains of the Exchequer as aforesaid, and if correct, shall be verified and stamped by the Comptroller-General, or some other officer of the Exchequer at Westminster, duly authorized, upon payment of such fees as are at present payable upon verification and stamping a set of measures under the Acts relating to weights and measures, and no stamp-duty shall be payable thereon.

VIII. The expense of providing and transmitting such copies of models of gasholders, with proper balances, indices, and apparatus as aforesaid, and of the stamp to be used by the inspectors, and the remuneration to the inspectors, shall be paid in England out of the stock raised in such counties, ridings, divisions, or counties of cities; and in Scotland such expenses in the respective shires and stewartries, and cities or royal boroughs, shall be assessed by the Commissioners of Supply upon such shires and stewartries, and upon cities or royal boroughs, by the magistrates thereof, and shall be paid along with the land-tax payable in such shires or stewartries and cities or royal boroughs to the collectors of the land-tax in such shires or stewartries and cities or royal boroughs respectively; and in Ireland such expenses in the respective counties, counties of cities, and counties of towns, shall be provided for and paid by presentments to be made by the grand juries on such counties, counties of cities, and counties of towns respectively; and the collectors of land-tax in Scotland shall have such and the same powers of levying and recovering the assessments to be made under this Act as are competent to them for levying and recovering the said land-tax.

IX. No maker or seller of meters or of gas, or person employed in the making or selling of meters or gas, shall be appointed an inspector of meters under the provisions of this Act; and every inspector shall forthwith enter into a bond or recognizance to the Queen, to be sued for in any courts of record, in the sum of three hundred pounds, for the due and punctual performance of the duties of his office, and for the due and punctual payment at such time or times as he may be directed by the justices, magistrates, or other persons by whom he may have been appointed, of all fees received by him under the authority of this Act, and for the safety of the said copies of models and stamps committed to his charge, and for their due restoration and surrender to such person or persons as may be appointed to receive them by the justices, magistrates, or other persons aforesaid, immediately on his removal or other cessation from office.

X. In England the justices in general or quarter sessions assembled, and in Scotland the justices or magistrates at a meeting called by the sheriff, and in Ireland the grand jury of each county, county of a city, or county of a town, shall determine and appoint on what days, at what hours, each and every inspector shall attend with the said copies of models and stamps in his custody at each of the several towns and other places where gas is consumed within their respective jurisdictions as they shall deem expedient; and every such inspector so attending shall examine, test, and if found correct, stamp all such meters as shall be required under the provisions of this Act to be so examined, tested, and stamped, and shall deface or destroy the stamp on any meter tested and found incorrect under the provisions of this Act, and he shall keep a book wherein he shall enter minutes of all such examinations and testings, with the numbers of identity and capacity marked by the manufacturer on such meters, and give, if required, a certificate under his hand of every such stamping and defacing; and every inspector shall once in every quarter of a year account to the treasurer of the county, riding, division, county of a city or county of a town, or to such other person as shall be duly authorized by those by whom he may have been appointed, for all fees received by him under this Act, and shall pay the amount thereof to such treasurer as aforesaid, who shall account for the same.

XI. No meter duly stamped under the authority of this Act shall be liable to be restamped, although the same be used in any other place than that at which the same was originally stamped, but shall be considered as a legal meter throughout the United Kingdom, unless found to be defective or unjust.

XII. In case any inspector of meters shall stamp any meter without duly testing and finding the same to be correct, or shall refuse, or for three days after being so required under the provisions of this Act neglect, without lawful excuse, to test any meter or to stamp any meter found to be correct on being so tested, or shall be guilty of a breach of any duty imposed upon him by this Act, or shall otherwise misconduct himself in the execution of his office, every such offender shall upon conviction forfeit a sum not exceeding five pounds for every such offence.

XIII. No meters shall be stamped which shall be found by the inspector to be capable of being made to register quantities varying more than two per centum from the true standard measure of gas by any contrivance moveable externally, or by decrease or increase of the water in such meter, or by any other means practically prevented in good meters, and every meter whether stamped or unstamped which shall be found by such inspector to be so capable of being made to register quantities varying more than two per centum from the true standard measure of gas shall be deemed incorrect within the meaning of this Act; and every meter which shall be found by such inspector to measure and register quantities accurately, or varying not more than two per centum from the true standard, and shall be found incapable by any such means as aforesaid of being made to register quantities varying more than two per centum from the true standard, shall be considered to be correct and be stamped as aforesaid, in such manner and on such part of the meter as shall in his opinion best prevent fraud, or as shall be specially directed by the authority appointing him.

XIV. The following rules shall be observed by the inspector in testing meters under the provisions of this Act:

Firstly, the meter shall be tested for soundness or leakage only, and not for per-centage of error, when fixed on a horizontal base, and with gas under a pressure equal to a column of water three inches high, with a light or lights consuming not more than one-twentieth part of its measuring capacity per hour, marked thereon, for all meters of a measuring capacity not exceeding two hundred cubic feet per hour, and not more than one-fortieth part of its said measuring capacity per hour for all meters of any greater measuring capacity per hour than two hundred cubic feet:

The meter to be tested for per-centage of error shall be fixed on a horizontal base, and shall be tested at a pressure equal to a column of water five-tenths of an inch high, and passing the quantity of gas or atmospheric air per hour which shall be marked thereon as its measuring capacity per hour, and the water used in such testing, and the air of the room in which such testing shall be made, shall be as nearly as practicable of the same temperature as the gas or air passed through the meter.

XV. If any person or persons other than those to be appointed under this Act shall make, forge, or counterfeit, or cause or procure to be made, forged, or counterfeited, or knowingly act or assist in the making, forging, or counterfeiting any stamp or mark which may be hereafter used for the stamping or marking of any meter under this Act, every person so offending shall for every such offence forfeit on conviction a sum not exceeding fifty pounds or less than ten pounds; and if any person shall knowingly sell, utter, or dispose of, let, lend, or expose to sale, any meter with such forged stamp or mark thereon, every person so offending shall for every such offence forfeit on conviction a sum not exceeding ten pounds or less than forty shillings, and all meters with such forged or counterfeited stamps shall be forfeited and destroyed.

XVI. Any person who shall knowingly repair or alter, or knowingly cause to be repaired or altered, any stamped meter so as to register unjustly or fraudulently, or who shall prevent or refuse to allow lawful access to any meter in his possession or control, or shall otherwise obstruct or hinder any examination or testing authorized by this Act of any such meter, shall on conviction forfeit a sum not exceeding five pounds, pay the fees for removing and testing, and the expense of purchasing and fixing a new meter; provided that the payment of any such penalty as aforesaid shall not exempt the person paying from liability or indictment or other proceeding at law to which he would otherwise be liable, or deprive any person of the right to recover damages against such person for any loss or injury sustained by such act or default.

XVII. Every consumer of gas may purchase and use for the measurement of the gas supplied to him any meter duly stamped under the authority of this Act; provided that the gas to be consumed per hour shall not exceed the quantity per hour the meter is intended to measure, so marked on the outside thereof as aforesaid.

XVIII. After the expiration of ten years from the passing of this Act all meters whatsoever which shall be used for buying and selling gas, or for the collecting of any tolls, rates, or duties, or for making any charges on the passage, transmission, or conveyance of gas, shall be examined and tested by an inspector under the authority of this Act, who shall, if found correct, stamp such meter in manner aforesaid; and every person who shall after the time fixed by this Act knowingly use any meter other than those authorized by this Act, or which has not been so stamped as aforesaid, or which shall be found to be incorrect within the meaning of this Act, or be otherwise fraudulent, shall on conviction forfeit a sum not exceeding five pounds, and any contract, bargain, or sale made by any such meter shall be void; and every such meter so used shall, on being discovered by any inspector so appointed as aforesaid, be seized, and on conviction of the person knowingly using or possessing the same, shall be forfeited and destroyed.

XIX. No meter shall be sold (except for exportation out of the United Kingdom), let, lent, or fixed for use in any part of Great Britain or Ireland, after the expiration of six months after the passing of this Act, unless the same shall have its measuring capacity at one revolution or complete action of the meter, and also the quantity per hour it is intended to measure in cubic feet or multiples or decimal parts of a cubic foot, denominated or marked on the outside thereof in legible letters or figures, and shall be stamped by an inspector of meters under the provisions of this Act, and every person who after the expiration of such six months shall sell (except as aforesaid), let, lend, or fix for use any meter before it has been so stamped, shall be liable to a penalty of five pounds for every such unstamped meter; and all meters required to be tested and stamped, except as hereinafter mentioned, shall be delivered to the inspector at the place where his testing gasholder and apparatus may be kept; and every purchaser and seller of gas by meter may, at his own expense, at any time after the expiration of the said six months, require any unstamped meter by which his gas is measured to be examined, tested, and if found correct, stamped, or he may at his own expense substitute a stamped meter in the place of any such unstamped meter: Provided always, that such purchaser or seller of gas shall before removal of any such unstamped meter for the purposes aforesaid, give twenty-four hours' notice in writing of such intended removal to the other party to the contract.

XX. The fees for examination, comparison, and testing, with or without stamping meters, shall be sixpence for each meter delivering a cubic foot of gas in four or more revolutions or complete repetitions of the action of the meter, and one shilling for each meter delivering a cubic foot of gas by any less number of revolutions or complete actions, or one revolution or complete action, and for each meter delivering more than one cubic foot of gas by one revolution or complete action the further sum of one shilling for every cubic foot of gas delivered at one revolution or complete action beyond the first cubic foot.

XXI. In England and Ireland it shall be lawful for every justice of the peace of any county, riding or division, or of any city or town, and in Scotland for every sheriff, justice, or magistrate of any borough or town, or for any inspector authorized in writing under the hand of any justice of the peace in England and Ireland, or of any sheriff, justice, or magistrate in Scotland, at the request and expense of any buyer or seller of gas, who shall have given twenty-four hours' notice in writing to the other party to the contract, at all seasonable times to enter any house or shop, store, warehouse, still, yard, or place whatsoever within his jurisdiction where any meter,

whether stamped or unstamped, shall be fixed or used, and to examine and test the same, and if necessary for such purpose to remove such meter, doing as little damage thereby as may be; and if upon such examination and testing it shall appear that any such meter is incorrect within the meaning of this Act, or fraudulent, the same shall not be refixed or used again unless and until altered and repaired so as to measure and register correctly, and stamped; and the fees on such removal, examination, and testing of a meter, whether stamped and replaced or not, shall be double the fees hereinbefore made payable for testing and stamping, and shall be payable and recoverable in like manner: Provided always that nothing in this Act contained shall be held to prevent any person duly authorized by any company or persons selling gas by meter from supplying water to any meter when necessary.

XXII. In case of any dispute between the buyer and seller of gas by meter, or between any owner of a meter and any inspector of meters under this Act, respecting the correctness of any meter, the inspector shall, if required by any such person dissatisfied with his decision, give such party his reasons, in writing, for such decision, and such party may require such meter to be examined and retested by two inspectors of adjoining or neighbouring districts, to be named by any justice of the peace having jurisdiction in the district where such meter shall have been tested; and the unanimous decision of such last-mentioned inspectors shall be final as to the correctness or incorrectness of such meter, except in case of appeal to the general or quarter sessions; and in case such two inspectors shall not agree, the decision of the inspector of the district to which such meter belongs shall be considered final, except in case of appeal to the general or quarter sessions, as hereinafter provided.

XXIII. In England and Ireland all persons who may think themselves aggrieved by any act or decision of any inspector or inspectors of meters, or by any order, judgment, or determination of any justice of the peace, mayor, or chief magistrate, relating to any matter or thing in this Act mentioned or contained, may within fourteen days next after such act, decision, order, judgment, or determination shall have been made or given, appeal to the justices of the peace at the then next ensuing general or quarter sessions to be held for the city, borough, or county within which the alleged cause of appeal shall arise, first giving seven days' notice in writing of such intention to appeal, and the grounds and nature thereof to the party against whom such complaint is intended to be made, and forthwith after such notice entering into a recognizance before some justice of the peace, mayor, or other chief magistrate, with two sufficient sureties, conditioned to try such appeal and abide the order and award of the said court thereon; and the said justices shall either hear and determine the said complaints at such general or quarter sessions, or, if they think proper, shall adjourn the hearing thereof till the following general or quarter sessions of the peace to be held for such city, borough, or county; and the said justices may, if they see cause, reverse or alter such decision, and mitigate any penalty or forfeiture, and may order any money to be returned which may have been levied in pursuance of such order or determination, and may also order any such further satisfaction to be made to the party injured as they shall judge reasonable, and may also order such costs to be paid to the party aggrieved by the party aggressing as they shall think reasonable.

XXIV. No proceeding to be had or taken in pursuance of this Act shall be quashed or vacated for want of form, or be removed by *certiorari* or by any other writ or proceeding whatsoever into any of Her Majesty's courts of record at Westminster or elsewhere, any law or statute to the contrary notwithstanding.

XXV. In Scotland all penalties incurred under the provisions of this Act or of any of the before recited Acts shall be recoverable with expenses either before the sheriff of the county or the magistrate of the burgh or town corporate wherein the same may be incurred or where the offender may reside, or before two or more justices of the peace of such county, at the instance either of the procurator fiscal of court or any person who may prosecute for the same; and the whole penalties, after deducting all charges, and such remuneration to the person prosecuting as the said justices shall think fit, shall be applied in aid of the funds liable under the provisions of this Act to the cost of providing and maintaining copies of the said models in the place where such penalties shall be awarded; and it is hereby provided that it shall be competent for the said courts respectively to proceed in a summary way and to grant warrant for bringing the parties complained of before them, and upon proof on oath by one or more credible witnesses or on the confession of the offender, or on other legal evidence, forthwith to give judgment on such complaint without any written pleadings or record of evidence, and to grant warrant for the recovery of such penalties and expenses, decerned for failing payment within fourteen days after conviction by poinding or by imprisonment for a period, at the discretion of the court, not exceeding sixty days, it being hereby provided that a record should be preserved of the charge and of the judgment pronounced.

XXVI. In Scotland if any person or persons shall feel themselves aggrieved by the sentence of any sheriff or magistrates of burghs or towns corporate, or justices of the peace, pronounced in any case arising under this Act, it shall be lawful for such person or persons to appeal to the court of justiciary at the next circuit court, or where there is no circuit court to the high court of justiciary at Edinburgh, in the manner and under the rules, limitations, and conditions contained in an Act passed in the twentieth year of the reign of His Majesty King George the Second, intituled "An Act for taking away and abolishing heritable jurisdictions in Scotland," with this variation only, that such person or persons so appealing shall in place of finding caution in the terms prescribed by the said Act, be bound to find caution to pay the penalty or penalties and expenses awarded against him or them by the sentence or sentences appealed from in the event of the appeal or appeals being dismissed, together with any additional expenses which shall be awarded by the court in dismissing the said appeal; and it shall not be competent to appeal from or to bring the judgment of any sheriff or justices of the peace acting under this Act under review by advocation, suspension, or reduction, or any other way other than as herein provided.

XXVII. In all actions brought against any person for anything done in pursuance of this Act, or in the execution of the powers or authorities thereof, such action shall be laid and brought in the country within which the cause of action shall have arisen, and the defendant or defendants in such action may plead the general issue and give this Act and the special matter in evidence at any trial to be had thereupon, and that the acts were done in pursuance or by the authority of this Act; and if they shall appear to have been so done, or that such action shall have been brought otherwise than as hereinbefore directed, then and in every such case the jury shall find for the defendant or defendants; upon which verdict, or if the plaintiff or plaintiffs shall become nonsuited, or shall suffer a discontinuance of his, her, or their action after the defendant or defendants shall have appeared hereto, or if a verdict shall pass against the plaintiff or plaintiffs therein or if upon demurrer or otherwise judgment shall be given against the plaintiff or plaintiffs, the defendant or defendants shall have his, her, or their costs, and shall have such remedy for recovering the same as defendants have for recovering costs of suit by law in any other cases.

XXVIII. No plaintiff shall recover in any action for any irregularity, trespass, or other wrongful proceeding made or committed in the execution of this Act if tender of sufficient amends shall have been made by or on behalf of the party or parties who shall commit such irregularity, trespass, or other wrongful proceeding before such action brought; and in case no tender shall have been made it shall be lawful for the defendant or defendants in any such action, by leave of the court wherein such action shall depend, at any time before issue joined, to pay into court such sum or sums of money as he, she, or they shall think fit; whereupon proceedings, order, and adjudication shall be had and made in and by such court as in other actions where defendants are allowed to pay money into court.

XXIX. And be it enacted, That this Act may be amended, altered, or repealed by any Act or Acts to be passed in this session of Parliament.

A BILL TO REGULATE THE PROCEEDINGS OF GAS COMPANIES AND OTHERS, SUPPLYING THE METROPOLIS WITH GAS.

Whereas the following gas companies, that is to say:—"The Gaslight and Coke Company," "The City of London Gaslight and Coke Company," "The Commercial Gas Company," "The Equitable Gas Company," "The Great Central Consumers' Gas Company," "The Metropolitan Gaslight and Coke Company," "The Independent Gaslight and Coke Company," "The London Gaslight Company," "The Phœnix Gaslight and Coke Company," "The Ratcliff Gaslight and Coke Company," "The Surrey Consumers' Gaslight and Coke Company," "The South Metropolitan Gaslight and Coke Company," "The Western Gaslight Company, Limited," "The Mitcham Gas Company," "The Imperial Gas Company," "The Crystal Palace District Gas Company," "The Wandsworth Gas Company," "The Woolwich Consumers' Gas Company," "The Woolwich Equitable Gas Company," "The Brentford Gas Company," or some of them, are respectively incorporated under the authority of Parliament for the purpose of supplying several districts of the metropolis with gas: And whereas the regulations to which those companies are subject are not uniform: And whereas it is expedient that provision be made for the due regulation of all companies and persons supplying gas within the metropolis with respect to matters in which the consumers of gas are interested: Be it therefore enacted by the Queen's most Excellent Majesty, by and with the advice and consent of the Lords spiritual and temporal, and Commons, in this present Parliament assembled, and by the authority of the same, as follows:—

PRELIMINARY CLAUSES.

I. This Act may, for all purposes, be cited as "Metropolis Gas Act, 1859."

II. This Act applies to the several gas companies named in the preamble to this Act, and to every other company already or hereafter established for supplying gas within the metropolis, and to all persons, not being companies, who, as a trade or business, already or hereafter supply gas within the metropolis, and whether those companies and persons respectively do or do not make gas as well as supply gas.

III. In the construction of this Act the following words and expressions have the following meanings, unless excluded by the subject or context, that is to say—

The word "company" means any gas company to which, or any person or persons supplying gas to whom this Act applies:

The expression "local authority" includes vestries and other parochial boards and bodies, and district boards, and trustees, commissioners, and persons respectively having or exercising jurisdiction over or in any of the streets in the metropolis, and having authority to contract for the lighting of the street:

The word "consumer" means a person receiving or entitled in accordance with this Act to receive a supply of gas from any company:

The expression "the metropolis" has the same meaning as in the Act eighteenth and nineteenth Victoria, chapter one hundred and twenty, for the better local management of the metropolis:

The word "district" means with respect to every gas company named in the preamble to this Act the district of the metropolis attributed to the same gas company in the Schedule A to this Act annexed, and means with respect to every gas company hereafter incorporated for supplying gas within the metropolis the district within which the same gas company shall be authorized to supply gas, and means with respect to any person or persons not being a gas company, but supplying gas within the metropolis, the district of the metropolis within which he or they shall from time to time as a trade or business supply gas.

The word "street" includes square, court, alley, highway, lane, road, thoroughfare, and public passage or place:

The word "premises" includes public and private messuages, and other buildings, lands, and tenements whatsoever:

The expression "the gas-works" means the gas-works of the respective company and the works connected therewith:

The expression "gas-rate" includes all rents and other payments for a supply of gas:

The expression "meter-rent" includes all rents and other payments for the use of gas-meters:

The expression "police magistrate" means any police or stipendiary magistrate acting in and for the district of the metropolis in which the matter referred to him arises.

IV. The limits of this Act shall be the metropolis.

V. Every company from time to time supplying gas within any district shall, at their own expense, on being required by the owner or occupier of any premises within the district, or partly within the district, or any local authority being a local authority wholly or partly within the district, provide and lay all proper and sufficient communication, service, and other pipes up to the premises to be lighted, to communicate with the gas company's mains, and shall, if so required by the owner, occupier, or local authority, furnish him or them, at the gas-rate prescribed by this Act, with a supply of gas for the purpose of being used in or on the premises, or for lighting the street, and, if so required by the owner, occupier, or local authority, furnish him or them, at the meter-rent prescribed by this Act, with one or more meters (no meter being more than a sixty-light meter) for ascertaining the quantity of gas consumed.

VI. Provided that the owner or occupier, if so required in writing by the company, shall, before being entitled to have the pipes provided and laid, or to have a supply of gas or of meters furnished to him, give to the company such security for the payment of the gas-rate for the gas to be supplied to him, and of the meter-rent for every meter to be supplied to him as he and the company shall agree on.

VII. Provided that if the company and the owner or occupier cannot agree on the security to be given, the same shall be determined by a police

magistrate, and any police magistrate shall, on the application of the company and the owner or occupier, or either of them, determine the nature and amount of the security to be given, and the security may be the deposit with the company, or with any person approved by the police magistrate, or the prepayment to the company of a sum of money, and the determination of the police magistrate shall be binding and final.

VIII. Provided always that every private consumer shall, if so required in writing by the company, consume the gas by meter; provided that every consumer may, if he thinks fit, provide his own meter.

IX. If the company not being entitled to require or not having required any security wilfully fail for three days after being thereunto required in writing by the consumer, or after the security agreed on or determined by the police magistrate is given, wilfully fail for *three* days to provide and lay all proper and sufficient communication, service, and other pipes, or to furnish a supply of gas, or to furnish any meter pursuant to the provisions of this Act, then and in every such case the company shall, on a summary conviction for the offence before a police magistrate, forfeit and pay to the consumer requiring the pipes, or gas, or meters, the sum of *forty shillings* for every day after the expiration of the respective three days during which the failure continues.

X. Every company from time to time may enter into any special contract with any owner, occupier, or local authority for all or any of the following purposes; that is to say, for supplying him or them with gas, and with pipes, burners, meters, lamps, lamp-posts, and other apparatus, and for the repair thereof, in such manner and on such terms and conditions as the parties agree: Provided that no such contract shall contain any term or condition contrary to any of the provisions of this Act, or for giving in case of difference the sole arbitrament thereon to the company, or for requiring any notice by a consumer discontinuing his supply of gas or meter which shall make him liable to pay more than *one fortnight's* gas-rate or meter-rent after the time of the service of the notice, or which shall entitle the company, except for breach of any of the provisions of this Act, to discontinue any supply of gas by less than two months' notice in writing to the consumer.

XI. Provided that, notwithstanding its being required by any Act of Parliament or otherwise, that the respective company's contracts shall be under seal, every special contract of the company entered into in accordance with this Act shall, without seal, be binding on them if the contract be signed by at least two directors of the company, or by the secretary thereof by the authority of the directors or at least two of them.

XII. In all cases in which the company are by Act of Parliament or otherwise authorized to cut off and take away the supply of gas from any premises, then, if the premises be unoccupied, the company, their agents, servants, or workmen, after giving *twenty-four* hours' previous notice in writing to the owner or his agent, by serving the notice on him; or if the owner or his agent be not resident within *seven* miles of the premises, or be not known to the company, by affixing the notice for *three* days on some conspicuous part of the premises, may enter into the same, between the hours of *nine* in the forenoon and *four* in the afternoon, and remove and carry away any pipes or fittings or other works, being the property of the company.

XIII. The quality of the gas supplied by any company shall be, as regards its illuminating power, such that an argand burner having fifteen holes and a seven-inch chimney, consuming five cubic feet of gas an hour, shall give a light equal to the light of *twelve* sperm candles, of six to the pound, each burning one hundred and twenty grains an hour; and shall be, as regards its purity, free from ammonia, bisulphide of carbon, sulphuretted hydrogen, and other agents detriorating its quality or its illuminating capacity.

XIV. A pressure of not less than *ten-tenths* or one inch head of water shall be maintained at all times on the service-pipes of the company or undertaker within the premises of the consumer.

XV. Every local authority taking any supply of gas according to this Act shall provide all proper and sufficient apparatus, machinery, and instruments for testing the pressure, quality, and illuminating power of the gas, and shall appoint from time to time, and pay out of any fund applicable by them for their local purposes, a chemical examiner or gas engineer or other competent person, who shall, as often as may be necessary (or as often as he shall be directed by the local authority appointing him), examine the quality, the illuminating power, and the pressure of the gas supplied, and shall present to the local authority, as often as they direct, a report, stating the number of examinations on which the report is founded, and the maximum, minimum, and average quality, illuminating power, and pressure, or the quality, illuminating power, and pressure from day to day, or at longer intervals, of the gas supplied during the whole period to which the report relates; and every local authority shall have power to affix any pipes, pressure gauges, indicators, pressure registers, or other machinery to any gas main or pipe passing through any street under its control, in order to ascertain the pressure of the gas delivered by the company.

XVI. Provided that two or more local authorities, if they think fit, may join in providing the apparatus, machinery, and instruments, and in appointing and paying the chemical examiner or gas engineer, or other competent person, and he shall make his reports to every local authority so joining in appointing and paying him.

XVII. Any consumer may make complaint to any police magistrate with respect to the quality, illuminating power, or pressure of the gas supplied to the complainant, and the police magistrate may entertain and hear the complaint and proceed thereon as he thinks just.

XVIII. The police magistrate, at any time within *one month* after the making of the complaint, may, if he think fit, appoint a competent person to examine into the complaint and to report thereon to a police magistrate, and may by the order appointing the examiner give to him any special directions.

XIX. The examiner shall immediately on his appointment have power to and shall forthwith inspect and examine the gas-works of the company, and inquire into and concerning the grounds of complaint, and shall make a report thereon in writing to a police magistrate, and if the police magistrate be not satisfied with the report, he may order any further examination and report which he thinks fit; and the company, and their officers, agents, and servants, and the complainant, shall afford to the examiner all reasonable facilities for the inspection, examination, and inquiry; and the examiner shall have power to call for all books, papers, writings, and documents relating to the subject of inquiry; and every person obstructing any such examiner in the exercise of his duties shall for every such offence, on a summary conviction for the offence before a police magistrate, forfeit *ten pounds*.

XX. After such examination and report as a police magistrate shall think sufficient, he may direct that notice be given to the complainant and the company to appear and be heard on the report at such time as he shall appoint, and each party may thereupon appear to be heard before a police magistrate by themselves, their agents, attorneys, or counsel, and if it shall appear to the police magistrate, and whether or not the company shall have appeared, that the complaint, or any part thereof, is well founded, he shall make an order declaring that the same is well founded, and ordering the company to pay any penalty or penalties thereby incurred, and to remove within a reasonable time the grounds of complaint, and he may by the order direct that any specific acts shall be done by the company for removing the grounds of complaint, and may make any order as to costs; and all orders so made shall be final and conclusive.

XXI. Where the company are served with any order so made, they shall, within the time limited by the order, remove the grounds of complaint thereby declared to be well founded, and pay the penalty or penalties, and the damages, if any, and costs, if any, thereby ordered to be paid by them.

XXII. The police magistrates for the purposes of this Act shall have full jurisdiction and full powers and authorities over and with respect to making orders on the parties and otherwise, and as to costs, and may issue every such summons, warrant, and other process, and may take such proceedings as they think requisite: and the service of any summons, notice, order, or other process in the matter on such person, or in such manner as a police magistrate shall direct, shall be good service thereof.

XXIII. If the gas supplied by the company shall at any time be of a less illuminating power or of less purity than the same according to this Act ought to be, the company shall for every such offence, on a summary conviction for the offence before a police magistrate, forfeit the sum of *one hundred pounds;* and also, in addition to the penalty of *one hundred pounds*, and whether that penalty be received or not, the sum of *ten pounds* for every day after notice in writing from the local authority, during which the offence continues.

XXIV. For the purposes of this Act, all powers and duties vested in the Metropolitan Board of Works may be exercised and performed at any meeting of the board at which not less than nine members of the board are present; and at any such meeting all questions shall be determined by the votes of the majority of the members present, and the board may act, notwithstanding any vacancies therein, and notwithstanding any omission to elect any member or members of the board.

XXV. The Metropolitan Board of Works shall from time to time appoint, and may remove at pleasure, one or more fit person or persons to be inspector or inspectors of meters, for the purposes of this Act; and every inspector shall be paid a salary or allowance of such amount, and to be paid by the companies in such proportions as the board and the companies from time to time agree on, or, failing such agreement, as the chairman of the board determines.

XXVI. Provided that any such agreement may be for any period, not exceeding *ten* years, which the companies think fit: Provided that no such determination by the chairman of the board shall be made for more than *three* years: Provided that no such agreement or determination shall be invalid by reason of its being afterwards discovered that any of the companies were not party to the agreement, or bound by the determination.

XXVII. Every inspector shall have power, at all reasonable times, to enter upon the works of the company, and also, at all reasonable times, but with the consent of the occupier thereof, to enter upon any premises supplied by the company, for the purpose of inspecting any meter, either on the gas-works or on the premises, and whether the meter be the property of the company or of the consumer; and shall have power to order the company or the consumer to remove any meter and to substitute another in lieu thereof, and shall have power to open and inspect any meter, and to test the correctness of the same, as he shall think fit, and shall have power to remove any meter to any other place for the purpose of more conveniently testing and examining the same, doing no unnecessary damage; and every meter which the inspector shall condemn as being incorrect, or order to be removed, shall be removed by the company or person whose property it is, and shall be replaced by a new one at the expense of the company or person, as the case may be, whose property it is.

XXVIII. Every meter on the gas-works of any company (except such meters as the company use for the registry of gas consumed by themselves or for experimental purposes) which shall be declared by the inspector to be incorrect, shall be marked by him with some clear special mark as incorrect and condemned; and no company shall supply any meter so marked to any consumer, and no consumer shall use for ascertaining the consumption of gas supplied to him by any company any meter so marked.

XXIX. After the expiration of *six* months after the passing of this Act, no meter shall be supplied by any company to any consumers, nor shall any meter be used by any consumer, until the same shall be inspected and tested, and some clear special mark, indicating that the meter is correct and approved, shall be affixed or put thereon by the inspector.

XXX. Provided, That any meter which shall be found by the inspector to be incapable of being made to register falsely at the rate of more than *two* per cent. of the quantity of gas passing through the meter, may and shall be delivered by him to be correct and approved, and shall be marked accordingly.

XXXI. The company with respect to any meter, whether the property of the company or of the consumer, used for ascertaining the consumption of gas supplied by the company, and the consumer with respect to any meter affixed on his premises, may from time to time have the meter tested by the inspector; and the inspector, on being thereunto requested by the company, or by the consumer, shall inspect and test the meter accordingly.

XXXII. The company or the consumer shall pay to the inspector for testing and marking every meter, and for testing every meter respectively, such fees as the Metropolitan Board of Works from time to time shall order; and the board, by the order fixing the fees, shall determine the cases in which the fees shall be paid by the company and by the consumer respectively.

XXXIII. If any company, their officers, agents, or servants, shall obstruct any inspector in the execution of the duties of his office, the company, and every person so offending, shall for every such offence, on a summary conviction for the offence before a police magistrate, forfeit *forty shillings;* and if any other person shall so offend, every such person so offending shall for every such offence, on a summary conviction for the offence before a police magistrate, forfeit *forty shillings*.

XXXIV. Any company may charge for gas the illuminating power of which from a five-feet burner does not exceed that of *eighteen* sperm candles, each burning one hundred and twenty grains per hour, any sum not exceeding *four shillings and sixpence* per thousand cubic feet, and no more; Provided that if any company shall supply gas of a higher illuminating power than as last aforesaid, they may charge for the same any sum not exceeding *six shillings* per thousand cubic feet; but the company shall not be entitled to make such higher charge without giving first to the consumer *three* months' notice of their intention to do so.

XXXV. Every company supplying one or more meters to any consumer may charge for the use of the meters the meter-rent following, that is to say:—

2-light meter	2s.	6d.
3 "	4	0
5 "	4	10
10 "	6	0
20 "	8	0
30 "	11	0
45 "	16	0
60 "	22	0
80 "	27	0
100 "	32	6

XXXVI. Provided, That for any meter less than a *one hundred* light meter, but not being one of the meters above specified, the company may charge a meter-rent proportionate to the meter-rents above specified; provided that no company shall be bound to supply any meter exceeding a *sixty*-light meter, and every company supplying a meter exceeding a *one hundred* light meter may charge for the same, by way of meter-rent, *ten per cent.*, and no more, on the cost of the company of the meter; and any special contract for charging more than *ten per cent.* so computed upon a meter-rent exceeding a *one hundred* light meter shall be utterly null and void.

XXXVII. In case any consumer shall leave the premises where gas was supplied to him without paying the company for the gas, or the rent of any meter, the company shall not require from the next tenant of such premises payment of the gas-rate or of the meter-rent left unpaid by the former tenant, unless the incoming tenant agreed with the former tenant to pay the unpaid gas-rate or meter-rent due to the company, but the company shall supply gas to the incoming tenant as prescribed by this Act upon being required by the incoming tenant so to do; provided that every person consuming gas, or using a meter, shall be liable for gas-rate or meter-rent for any fractional part of the period for which payments are ordinarily made to the company during which he is supplied with gas or a meter.

XXXVIII. If any meter shall, from any cause whatever, wholly cease for any time to register, or shall be found on examination by an inspector to register incorrectly against the consumer, so that the amount fairly due for gas consumed during the time cannot be ascertained, then, if any dispute shall arise between the company and the consumer as to the amount to be paid for gas during the time, the dispute shall be referred to and be determined in a summary way by a police magistrate.

XXXIX. The company shall well and effectually light all public lamps in all streets which they shall be required by the local authority to light, and shall not charge a higher price per 1000 cubic feet for the gas consumed by the public lamps than the lowest price charged by the company to private consumers in that part of the district in which the lamps are situate; and if any dispute shall arise between the company and any local authority as to the gas-rate to be charged for such lighting, the dispute shall be referred to and determined by a police magistrate: Provided that the company shall not be compelled to light any street with lamps at a greater distance from each other, measured in a line on each side of the street parallel to the direction of the same, than *one hundred* yards.

XL. The local authority may provide and keep in repair their own lamp-posts and lamps, and light and extinguish the lamps, and defray the expenses thereof; and the company, on being thereunto required by the local authority, shall supply them with gas for their lamps, charging for the gas only the gas-rate by this Act prescribed.

XLI. Every company shall, within *one year* after the passing of this Act, cause a map to be made of the district within which their mains or district mains then lie, on a scale not less than *six* inches to a mile, and shall cause to be marked thereon the course, situation, and diameter of all their then existing mains and district mains; and shall, from time to time, within *six* months after the making of any alterations or additions, cause the map to be corrected, and such additions made thereto as will show the line and situation, and also the diameter, of all their mains and district mains; and the map, or a copy thereof, with the date expressed thereon of the last time when the same was so corrected, shall be kept in the principal office of the company, and shall be open to the inspection of all persons interested in the same within the district, who shall be at liberty to take copies of or extracts from the same; and every company wilfully failing to comply with any of the requirements of this enactment, shall for every such offence, on a summary conviction for the offence before a police magistrate, forfeit ten pounds.

XLII. Every company, on the application of any consumer supplied with gas by them, shall furnish to the consumer the particulars of any district main from which the consumer is supplied, together with the names of the streets through which the district main passes, and the commencement and termination thereof.

XLIII. Any company having under any present or future Act of Parliament power to break up the soil and pavement of any street may (with the consent of the vestry or district board of the district in which the street is situate) make and maintain permanent subways or tunnels under any street through which such company have power to lay mains and pipes, with gulleys, or vertical or inclined shafts, or entrances in any part of the street, into the subways, affording access thereto, for the purpose of inspecting, removing, or relaying pipes, or for any purpose connected with the distribution of the gas, so as to avoid repeated disturbance of the soil and pavement of the street, and for that purpose may execute any works according to any plan approved by the engineer of the company and by the Metropolitan Board of Works, and agreed to by the vestry or district board.

XLIV. The Metropolitan Board of Works may, and on the requisition in writing of any local authority shall, in the month of *December* in every year, or at such other time in every year as the board, having regard to the period of the year when any company habitually makes up and passes their yearly accounts, think fit, appoint one or more fit person or persons to examine and audit the accounts of the companies for their preceding financial year; and every such auditor shall be paid, by every company whose accounts he shall audit, a sum not exceeding *three guineas* for every day that he shall be fully employed upon the audit, and also all such reasonable expenses as he shall be put to in auditing the accounts; and the company shall lay before the auditor or auditors, at every such audit, the accounts of the company for the year preceding, accompanied by proper vouchers, and submit to his or their inspection all books, papers, instruments, and writings belonging to the company, relating to their accounts; and the auditor or auditors shall audit the accounts, and may examine any of the directors or officers of the company whom he or they shall think fit; and he or they may summon before him or them any such director or officer for the purpose of examination, and may take the examination upon oath, and administer an oath to the person summoned.

XLV. Every company which for *one month* after being required in writing by any auditor to furnish any such accounts or vouchers as they are by this Act required to furnish shall fail so to do, shall on a summary conviction for the offence before a police magistrate forfeit *fifty pounds* for every day after the expiration of the month during which the failure continues; and every person liable to this Act to be examined by any auditor, and failing when summoned to attend, or attending and refusing to be so examined, or to take the oath, shall for every such offence, on a summary conviction for the offence before a police magistrate, forfeit *ten pounds*.

XLVI. If the accounts are not found correct or complete they may be corrected and completed, and when the accounts are finally found correct and complete the auditor or auditors shall sign the same, and shall publish an abstract of the same, at the expense of the company, by advertisement in one of the London daily morning newspapers; provided that if any auditor shall think fit to make any observation on any accounts produced to him, or on the mode of keeping the accounts, he may subjoin the observation to the account, and shall sign the observation as well as the accounts.

XLVII. If and whenever the auditor or auditors shall report that any company have earned, during the *five* years preceding the date of the report, as profits upon their capital, the respective dividends specified in Schedule B to this Act, and that, whether the company shall, during the *five* years, or any part thereof, have actually paid the full profits by way of dividend, or shall have paid part thereof by way of dividend, and in any way added the residue thereof to capital, the company shall thenceforth reduce the price of the gas supplied by them to such sum per thousand cubic feet of gas of the illuminating power prescribed by this Act as the Metropolitan Board of Works shall fix, and shall supply gas at the reduced price, and shall continue to supply gas at the reduced rate, until the auditor or auditors shall report that the profits of the company do not amount to so much as would, if paid by way of dividend, make up the dividends specified in Schedule B to this Act, and on the auditor or auditors so reporting the company may raise the gas-rate to not exceeding *four shillings and sixpence* per thousand cubic feet.

XLVIII. If and whenever it shall appear to the Metropolitan Board of Works that any of the provisions of this Act have been violated, or not complied with on the part of any company, or that the company are acting in a manner unauthorized by law, irrespective of this Act, and if it shall appear to the board that it would be for the public advantage that the company should be restrained from so acting, or compelled to do any Act for remedying the wrongful act done by them, the board shall certify the same to Her Majesty's Attorney-General, and thereupon he shall, if he be so advised, proceed by information, bill, or action, or other such proceeding, at law or in equity, as the case may require, to restrain such wrongful acting, or to compel the doing of such Acts for remedying the wrongful acts.

XLIX. Provided, That no such certificate shall be given by the Metropolitan Board of Works until twenty-one days after they have given notice to the company, in relation to whom they shall intend to give the certificate, of their intention to give the same; and the notice shall be in writing, and shall specify clearly the grounds of complaint on which the certificate is intended to be given; provided that no such proceedings shall be taken by the board except within *one year* after the offence specified in the certificate is committed.

L. Provided, That no special remedy or provision for giving relief to any person, given by or contained in this Act, shall oust, prejudice, or diminish the general jurisdiction of any of Her Majesty's superior courts of law or equity over or in respect of the acts or defaults in respect of which the special remedies or provisions are so given or contained.

LI. No company or person shall hereafter erect any gas-work for supplying gas as a trade or business, within the limits of the metropolis, without the previous consent in writing of the Metropolitan Board of Works.

LII. Nothing in this Act contained shall avoid, prejudice, or impair any of the powers now exercised by or vested in the Metropolitan Board of Works, or any powers by law vested in any local authority within the metropolis, or any powers now exercised or possessed in respect of the manufacture or supply of gas within the metropolis by any railway company, or by any other person or persons making or supplying gas for his or their own use, and not making or supplying gas to the public as a trade or business; nor shall anything in this Act contained avoid, prejudice, or impair the validity of any existing contract, undertaking, deed, matter, or thing relating to the supply of gas made and entered into or done before the passing of this Act, by and between any company and any consumer, which would, as regards the company and the consumer, be binding on them respectively if this Act were not passed.

LIII. Every penalty imposed by this Act the recovery and application of which is not specially provided for by this Act shall be recovered, enforced, accounted for, and paid to the receiver of the Metropolitan Police District, and shall be apportioned in the same manner as penalties or fines other than fines upon drunken persons, or upon constables for misconduct, or for assaults upon police constables, are directed to be recovered, enforced, accounted for, and paid and applied by an Act passed in the third year of the reign of Her present Majesty, intituled "An Act for Regulating Police Courts in the Metropolis;" and every order or conviction of any of the police magistrates in respect of any such forfeiture or penalty shall be subject to the like appeal, and upon the same terms, as is provided in respect of any order or conviction of any of the police magistrates by that Act; and every police magistrate by whom any order or conviction shall be made shall have the same power of binding over the witnesses examined, and the witnesses shall be entitled to the same allowance of expenses as they would be entitled to in case the order, conviction, and appeal had been made in pursuance of that Act.

LIV. All penalties by this Act imposed shall be recoverable according to the provisions of the Act of the twelfth year of her present Majesty, chapter forty-three, for the administration of justice, save only that the same shall be recoverable only before magistrate.

LV. All the costs, charges, and expenses of and incident to the applying for and passing of this Act shall be borne and paid as to *one half* thereof by the several companies named in the preamble to this Act, in proportion to their respective subscribed capital, and as to the *other half* thereof, by the several vestries and district boards specified in Schedules A and B to the Act for the better local management of the metropolis, in proportion to their respective contributions to the metropolitan main drainage rate.

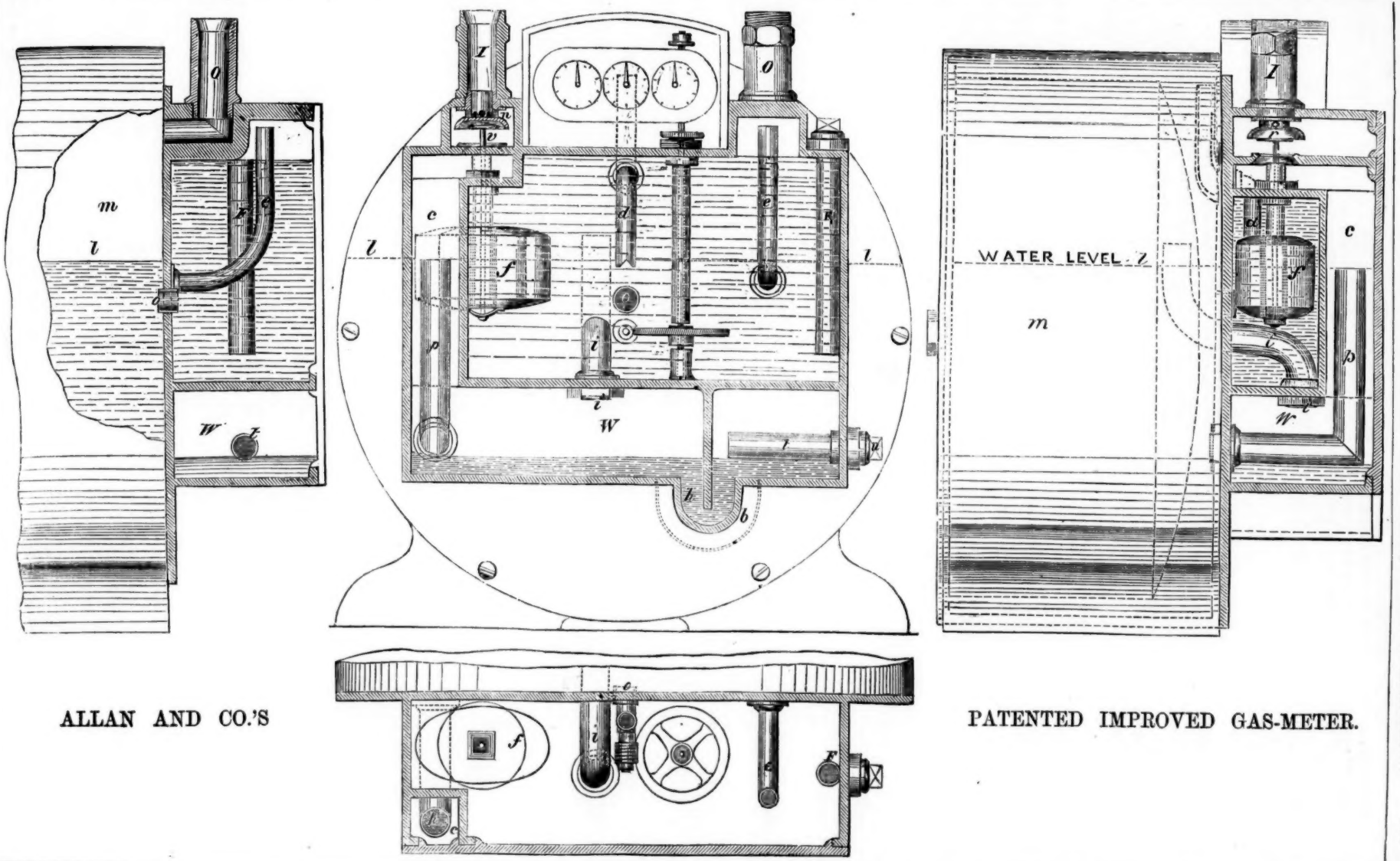
SCHEDULES.

SCHEDULE A.

I. Name of each company, and limits within which it is authorized and required to supply gas.

SCHEDULE B.

II. Amount of capital of each company, under proper heads, and showing the amount of dividend to which each kind of capital is entitled.



ALLAN AND CO.'S PATENTED IMPROVED GAS-METER.

ALLAN AND CO.'S PATENTED IMPROVED GAS-METER.

In this improved meter the arrangements are to hold in suspension a supply of water to compensate for evaporation, waste, or abstraction of water from the drum-case, and maintain therein under all circumstances an uniform water-level, together with other improvements in details.

The supply of water is held in suspension under any pressure, and is regulated by a pneumatic dip-pipe (open from the meter to the separate fountain), the surface-line in the case being fixed or determined by the depth to which the pneumatic dip-pipe descends into the fountain.

As the same pressure exists in the pneumatic dip-pipe (*d*) as in the measuring-case (*m*), the water cannot rise in the former higher than the measuring-line (*l*), so that on the smallest quantity of water (three or four drops) leaving the measuring-case (*m*) the pneumatic balance is destroyed, and a bubble of gas will leave the pneumatic dip-pipe (*d*), rise to the top of the supply-fountain, and allow an equal quantity of water to flow through the orifice (*o*) connecting the fountain and case, and at once restore the true water-line (*l*). This operation will continue so long as there is evaporation or abstraction of water from the case, and water in the fountain to supply the same. The instant the latter fails the float (*f*) descends and closes the inlet-valve (*v*), so that the water in the case (*m*) can never fall below the true line (*l*) *while gas is passing through the meter.* Accumulation of water in the measuring-case is effectually prevented by an overflow-pipe (*p*), which is fixed into the case (*m*) at such a height as will not allow of the measuring-case (*m*) being overfilled.

The same overflow-pipe (*p*) being placed in advance of the pneumatic dip-pipe (*d*) and in the square front prevents tilting, as, on the meter being depressed for the purpose of abstracting water from the drum-case (*m*), the water will overflow into the waste-water box (*w*), and, closing the inlet-passage (*i*), at once shut off the gas; and the meter must be restored to its level again in order to renew the supply, whereupon the pneumatic dip-pipe (*d*) will come into operation as before, and restore the true water-line.

The inlet-pipe (*I*) communicates by means of a rose (*r*), covering the valve (*v*) to prevent its being tampered with. The valve-box (*v*) opens into a rectangular chamber (*c*) large enough to hold the overflow-pipe (*p*), and admits of the passage of the requisite supply of gas into the waste-water box (*w*), from which it passes into the measuring-drum (*m*) by the pipe (*i*).

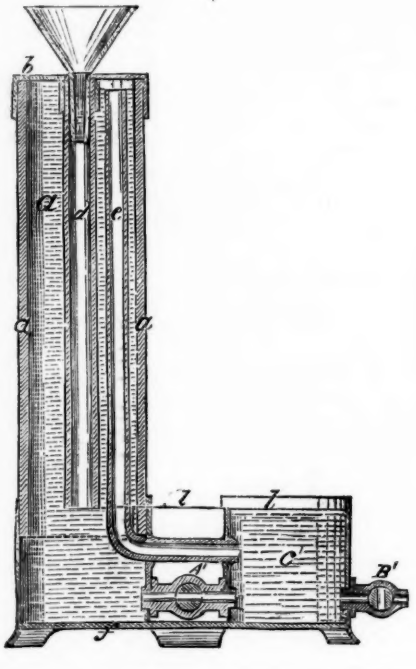
Abstracting gas from the waste-water box (*w*) is prevented by a division-plate and cell, forming a hydraulic seal (*h*), (or a bent pipe (*b*) may be used in tin meters); and a tube (*t*) is fixed to the outlet (*u*), carrying off the water to the depth of the pipe (*t*) only.

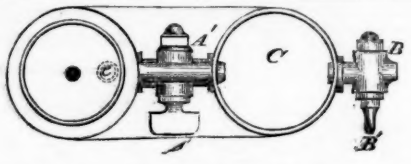
The square front forming the fountain above the water-line may be of any convenient size to keep up the supply to the drum-case for any period; and if the evaporation or waste in, say a 5-light meter, be five or fifty cubic inches in a given time, the measurement will be true and uniform, the meter being accurate to begin with.

The supply-fountain may be refilled at any time without disturbing the conditions of the meter, as the filling-pipe (*F*) descends *below* the level of the pneumatic dip-pipe, and any gas on the top of the separate fountain will escape into the measuring-case again by means of the exhaust-pipe (*e*), the orifice of which is sealed against a return escape of gas by being placed below the water-line in the measuring-case.

The pneumatic dip-pipe application is *new* and correct in principle, and by the use of it—of the fountain and the simple combination of pipes in the meter—it will be seen that, from its extreme simplicity in details, the machine is not likely to get out of order, and it will give greater security and more correct measurement (and therefore less annoyance) to both the public and the companies than has been hitherto attained.

As a practical illustration of the law on which this meter is founded, a simple experiment may be made:—





Construct a toy fountain, as shown in the drawings. Let the large tube (*a*) and also the pneumatic dip-pipe (*d*) be of glass; the top cover (*b*), exhaust-pipe (*e*), and bottom frame (*f*), may be of tin or brass, with two small cocks (*A' B'*). The exhaust-pipe must enter the chamber (*c'*) below the bottom of the pneumatic dip-pipe (*d*). The covers must be jointed so as to be air-tight. After filling the fountain by means of a small tundish through the pneumatic dip-pipe, open the cock *A'*, and the water will only rise in the vessel or chamber (*c'*) to the level line (*l*). Open, however, the cock *B'*, and allow the water to escape slowly, and the pneumatic dip-pipe will again come into play, and the water will be maintained at one level in the chamber (*c'*), thus illustrating the manner in which the level is maintained in the meter.

METROPOLIS GAS SUPPLY.

A deputation waited upon the Home Secretary on Tuesday the 5th inst. on the above question.

The Honourable G. Byng, M.P., introduced the deputation, directing the attention of Sir G. C. Lewis to the fact that this question had been before committees in two sessions; that some most valuable evidence had been received and presented to the House of Commons; but that, from unfortunate divisions in the committee (to which he need not particularly refer), it had been found necessary to proceed by bill; and the gentlemen present simply desired to explain to the Home Secretary what they had previously explained to Mr. Walpole—the grievance under which the metropolis laboured and the remedies suggested.

Dr .Bachhoffner stated briefly that the gas companies had in 1857 effected an arrangement, by which certain companies withdrew from the districts they had previously lighted, without any concert or arrangement through Parliament leaving in most cases only one company to supply the district, thereby establishing a monopoly in what was now a necessary of life. That the effect had been considerably to embarrass many vestries and district boards, in affecting the lighting of the public streets, and it was even feared some districts would be left in total darkness from the disagreements. That on applying to the companies having parliamentary powers to light the streets they had declined, and that in many cases the price had been considerably raised.

Sir G. C. Lewis inquired whether this districting was in pursuance of parliamentary powers in their several Acts, or how it had been effected?

Mr. Beal, honorary secretary, explained that the Acts under which they were incorporated distinctly recognized the principle of competition, and that what had been done privately had been successfully opposed when sought to be effected by bill.

Sir G. C. Lewis inquired who were the promoters of the bill, and was informed it would be introduced by Sir J. V. Shelley, at the request of the parishes.

Mr. Locke, M.P., drew the attention of the Home Secretary to the bill some time since introduced by Mr. Locke King to legalize districting on the south side of the Thames, and which had not passed.

Mr. Williams, M.P., also referred to this attempt, and to the great efforts made to oppose it.

Mr. Beal drew the attention of the Home Secretary to the unfortunate position of the metropolis compared with provincial towns having corporate powers, that there was no central municipal power to represent their interests, and on that ground sought the Government aid. He thought that, had Parliament known when the Acts were applied for that a monopoly was to be established, restrictions would have been imposed; and the deputation now sought the same relief that would have been granted as a matter of course had such a power been asked. He drew attention to the return presented to the committee by the companies, showing that over 200 miles of streets had been transferred without the knowledge of the parties concerned; that great grievances existed as to meterages, calling for legislative attention; and that the evidence of Mr. Hughes, reported in the Blue-book, established conclusively the case of the deputation. He then referred to the proposed bill as affecting the whole metropolitan area included in Sir B. Hall's Act, and urged upon the Home Secretary that, in the absence of a municipal authority, the Government should aid them in settling on an honourable basis the future arrangements for the supply of gas, and instanced the case of the water supply inquiry of 1852 as a precedent.

Mr. Edwin James, M.P., also drew attention to the water supply inquiry as a case in point, and that he had then acted as counsel for the Government.

Sir G. C. Lewis inquired whether the metropolitan board had not power to act, as he thought it was intended by the bill to give this power.

Sir J. V. Shelley said it had originally been included, but was withdrawn at the close of the session, some difference on that point existing with the Lords.

Mr. Beal said it was intended by this bill to give such powers to the Board of Works, as the nearest approach to municipal action for the metropolis; and that the machinery in connexion therewith would, he hoped, give the relief sought.

Sir G. C. Lewis said he would consider how far the proposed bill met the grievance, and what could be done; and inquired if the gas companies agreed to the bill?

Mr. Beal replied that, so far as it recognized districting, they were favourable; but there were some other portions they strongly objected to.

Sir J. V. Shelley explained the attempts at a compromise in the committee; and thought that, if the Government would look at the question, it could be settled satisfactorily.

Sir G. C. Lewis: At present all I can say is, that by the second reading I will try to form an opinion of the question, and act accordingly.

The deputation, having thanked Sir G. C. Lewis for his attention, then retired.

LORD REDESDALE'S GAS BILL.

DEPUTATION TO THE PRESIDENT OF THE BOARD OF TRADE.

On Friday last, a deputation waited on the Right Hon. Milner Gibson, at the offices of the Board of Trade, on the subject of the bill now in the House of Lords for insuring accuracy and uniformity in the measurement of gas. The deputation consisted of the following among other gentlemen: the Hon.

F. Calthorpe, M.P., Lord Ashley, M.P., Mr. Alfred Hayman (Messrs. Youngman, Hayman, and Burnett,) Mr. Octavius Symonds, Mr. Marriott (Messrs. Marriott and Jordan), parliamentary agents to the bill, and Mr. John Lilwall, secretary to the promoters of the measure.

After a few brief remarks by the Hon. Mr. CALTHORPE, who introduced the deputation,

Mr. MARRIOTT stated that Lord Ebury, who had just left, being prevented from remaining by another engagement, had authorized him to express his lordship's entire approval of the principle of the bill. He said that in the absence of any legal standard for the measurement of gas, the greatest irregularities existed, and that it was known that there were meters now in use registering from 5 to 30 and even 40 per cent. against the consumer. The object of Lord Redesdale's bill was to correct these irregularities. The bill had been very carefully examined, clause by clause, by that nobleman, to whom various suggestions had been made with reference to this measure by practical as well as scientific persons, including the representatives of the Imperial Gas Company, and so far as was compatible with the preservation of the general principle of the bill, those suggestions had been adopted. The bill was very simple in its provisions, and would involve the creation of no new machinery for its administration, as the testing and stamping of meters might be performed by the same class of inspectors as were employed for the examination of ordinary weights and measures. The bill had the support of a large number of eminent persons, some of whose names he particularized, and it applied to the whole of the United Kingdom.

The PRESIDENT of the BOARD of TRADE asked whether the bill would necessitate persons having new meters?

Mr. MARRIOTT replied that after six months from the passing of the bill all new meters would require to bear the Government stamp, but that a period of ten years was allowed for meters already in use before it became obligatory on the part of the companies to have them stamped, but that the consumer or supplier would be authorized to have his meter tested and stamped by the inspector immediately the bill became law.

Mr. LILWALL observed that under such circumstances, if the consumer deferred having his meter examined, the fault as well as the consequence of that neglect would rest with himself.

Mr. CLIFT introduced a meter with a view to explain the mechanism of this instrument, and showed by a reference to and a comparison of what should have been and what was actually its water-mark, that it had been for years registering as much as 20 per cent. against the consumer. His illustrations further went to show how that by means of Lord Redesdale's Bill such serious irregularities would be prevented.

Mr. J. T. STANESLEY said that at present the consumer had no check on gas meters. On comparing his gas bills for two corresponding quarters there was a difference of nearly 40 per cent.; and he showed two receipts which had been put into his hands by a neighbour, whose time of burning gas was most regular and uniform, which exhibited a still greater disparity against the consumer.

Mr. ALFRED HAYMAN said that his firm were large consumers of gas, and they had found a yearly increase in their gas bill, while the circumstance connected with their burning the commodity remained substantially the same. It was quite time that something was done to remedy the growing evil.

Mr. LILWALL observed that at present the consumer was entirely at the mercy of the gas company, being, generally speaking, as ignorant of the mechanism of a meter as he was of the mechanism of his watch. He wished to impress upon the right honourable gentleman two points—namely, that the bill sought to give no undue advantage to the consumer over the company, but merely aimed at securing for the former full measure for his money, and that the sale of other commodities had long been subject to a precisely similar check to that which it was now proposed to apply to the measurement of gas.

The PRESIDENT said, my attention having only just been drawn to the subject, I am not sufficiently acquainted with the details of the bill to give any definite answer to the deputation at present, but I will occupy myself with it. When it comes before the House of Commons it shall receive my best consideration.

The deputation then withdrew.

Price Current.

CASTINGS, per Ton.

Average Weight of Cast-Iron Gas-Pipes, per Yard.

1½ in.	2 in.	2½ in.	3 in.	4 in.	5 in.	6 in.	7 in.	8 in.	9 in.	10 in.	12 in.
16	21	28	33	51	70	89	107	126	149	177	208 lbs.

Retail Prices are 5 to 10 per cent. higher.	London.	Glasgow.	Newcastle.	Wales.	Yorkshire, Derbyshire, and Staffordsh.
	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.
Pig Iron, No. 1	3 15 0	2 12 6	2 17 6	3 5 0	3 10 0
1½ and 2 inches Socket-Pipes	7 0 0	6 0 0	6 5 0	6 10 0	6 15 0
2½ and 3 „ „	6 10 0	5 10 0	5 15 0	6 0 0	6 5 0
4 and 5 „ „	6 0 0	5 0 0	5 5 0	5 10 0	5 15 0
6 in. and upwards „	5 15 0	4 15 0	5 0 0	5 5 0	5 10 0
Retorts, 1st fusion, hot blast	5 10 0	4 10 0	4 15 0	5 0 0	5 5 0
„ 2nd „ cold „	6 10 0	5 5 0	5 10 0	6 0 0	6 5 0
Tank Plates, ⅜ thick and above	6 0 0	5 0 0	5 5 0	5 10 0	5 10 0

WROUGHT-IRON TUBING,

Subject to 40 per cent. Discount.

	2 in.	1½ in.	1¼ in.	1 in.	¾ in.	½ in.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
Patent Welded Tubes, from 2 to 12 ft., perft.	1 8	1 0	0 10	0 7	0 5	0 4½
„ „ „ 6 in. to 18 in., each	3 0	2 0	1 9	1 3	1 0	0 9
Connecting-Pieces, or Long Screws	3 6	2 3	2 0	1 6	1 2	0 11
Bends, Springs, and Elbows—wrought iron	3 9	2 3	1 9	1 0	0 10	0 8
Tees, wrought or cast	4 0	2 6	2 0	1 6	1 1	0 10
Crosses, wrought or cast	4 6	3 0	2 6	2 0	1 6	1 2
Iron Cocks	17 6	9 6	7 6	4 6	3 3	2 6
„ with brass plug	28 0	16 0	13 0	7 0	5 6	4 6
Diminishing Sockets, Caps, Plugs, and Plain Sockets [Nipples	1 3	0 9	0 8	0 6	0 5	0 4
Syphons, 2 quart	1 0	0 8	0 7	0 5	0 4	0 3
	15 0	14 0	13 6	13 0	12 0	—

COALS, per Ton.

Newcastle.—Unscreened.		*Scotch Cannel.*	
Whitwell Primrose	6s. 3d.	Boghead, at Leith	40s. 0d.
Medomsley, Eighton Moor, and Burnhope	6 6	Kirkness, best	23 0
Pelaw	6 9	Capeldrae, 1st quality	20 0
New Pelton, Peareth, South Pelaw, Washington Hutton, and South Peareth	7 0	„ 2nd „	12 6
Pelton	7 9	Lesmahago, at Glasgow	25 0
Ramsay's Newcastle Cannel	16 0	„ „ Leith	27 6
		Arniston	22 0
		Wemyss	20 0
		Knightswood	18 0
		Pirnie	15 0

SUNDRIES.

Best Newcastle Fire-bricks	per 1000	50s. 0d.	
Cliff's Fire-bricks, at Wortley	per 1000	57 6	
Ingham's Fire-bricks, at Wortley	„	55 0	
Fire-clay Retorts	per foot run, 5s. 6d. to	7 0	
Tough Cake Copper ... per ton	£107 10s.	Foreign Spelter ... per ton	£21 5 0
English Pig Lead ... „	22 15	English Block Tin ... „	138 0 0
Welch Bar Iron, in London „	7 0	Banca ... „	146 0 0
Tarred Rope Yarn	per cwt. 26s. 0d.		

FREIGHTS.

Coastwise—Newcastle.—Per Ton.		*Foreign.—Per Keel.*	
Chatham & Rochester	5s. 9d.	Boulogne and Calais	£7 10
Cork	—	Barcelona	26 0
Dover	6 0	Bordeaux	16 0
Dublin	9 0	Cadiz	18 0
Exeter Quay	7 6	Copenhagen	9 0
Folkestone	6 0	Dieppe	9 10
Hastings	—	Genoa	24 0
London (Wharf) ... 5s. 9d. to	6 0	Hamburg	7 15
Lowestoft & Yarmouth ... 4s. 6d. to	5 0	Havre	9 10
Lynn	—	Leghorn	24 0
Portsmouth	8 0	Lisbon	19 0
Plymouth	8 0	Rotterdam	7 10
Whitstable	7 0	Stettin	11 0
Weymouth	—	Trieste & Venice	£29 to 31 0

Advertisements.

LIVESEY FIRE-CLAY WORKS,
NEAR BLACKBURN, LANCASHIRE.

ORLANDO BROTHERS,
MANUFACTURER OF PATENT CLAY RETORTS,
AND EVERY DESCRIPTION OF
TUBULAR GLAZED SEWERAGE PIPES, BENDS, JUNCTIONS ETC.
FIRE-BRICKS, TILES, BLOCKS, AND CHIMNEY-TOPS.

WILLIAM SUGG,
GAS ENGINEER, AND GENERAL GAS APPARATUS MANUFACTURER,
19 and 20, MARSHAM STREET, WESTMINSTER.
WATER and DRY GAS-METERS, with all the latest improvements.
Improved GOVERNORS of all kinds.
STATION-METERS of first-class quality.
PHOTOMETERS, PRESSURE-GAUGES, TEST-METERS, GASHOLDERS, &c.
GOVERNORS for Street Lamps, 36s. per dozen.
STREET-LAMP LAVA BURNERS, cased in Brass, 24s. per gross—to burn 2½, 3½, 4, and 5 feet per hour.
Argand, Sun-Ring, Photometer, and all kinds of Burners in Lava.

LESMAHAGO GAS COAL.

JAMES FERGUSON and CO., Lessees of the Auchinheath and Craignethan Gas Coal-fields (the most extensive and valuable in the parish of Lesmahago), respectfully intimate to the Managers of Gas-Works and Consumers of Gas Coal, that he is prepared to ship the best quality of the above well-known COALS at Glasgow or Leith; and also to deliver them at the railway stations upon, or connected with, the Caledonian Railway, to any extent which may be required.

Price, free on board, or delivered at the railway stations, may be learned by addressing James Ferguson and Co., Gas-Coal Works, Lesmahago.

Shipping Agent for Glasgow:
MR. ALEXANDER STRATTON,
159, WEST GEORGE STREET.

WM. RICHARDSON and CO.,
SPRING GARDEN IRON-WORKS,
DUDLEY, near BIRMINGHAM,
Manufacturers of Gas Apparatus in all its branches.
A large assortment of New and Second-hand Gas Apparatus constantly for Sale.
Gas Apparatus Enlarged and Exchanged.

CHARLES BOTTEN and SON,
ENGINEERS & METER-MAKERS,
CRAWFORD PASSAGE, RAY STREET,
CLERKENWELL, LONDON (E. C.).
Manufacturers of Station and Patent Protector Consumers' Meters, Patent Slide-Valves, Gas-Fittings, Pipes, &c.
Also, High-pressure Cocks, Hydrants, Closets, and all Water-Fittings.

THE PURIFYING-HOUSE SUPERSEDED.

MR. LAMING (Inventor of the Revivified Oxide of Iron Purification) has the satisfaction to announce that Gas may now be purified in a manner that combines unusual commercial advantages with all the possible requirements of the sanitary officer and the public. All that need be said to call attention to the new process is, that instead of the purifying-house, two vessels of small area, placed after the condenser, suffice; that these vessels never have the least communication with the atmosphere; and that neither lime, oxide, nor any other substance foreign to the gas itself is brought into contact with it. Gas engineers will perceive among the advantages thus offered, economy in room, labour, and materials; impossibility of nuisance; and total absence of injury to the illuminating power.

Particulars by addressing RICHARD LAMING, 118, FENCHURCH STREET.

EDWIN DIXON,
WOLVERHAMPTON PATENT WROUGHT-IRON TUBE WORKS,
Originally established in 1833,
Manufacturer of Gas and other Tubes, Fittings, and articles of every description belonging to Gas, Water, or Steam.

E. D. had the honour of receiving the
PRIZE MEDAL
awarded to this Manufacture by the COUNCIL of the GREAT ENGLISH EXHIBITION of 1851; and from the latter date has supplied many towns exclusively with GALVANIZED and other Tubes for Gas and Water, under GOVERNMENT ENGINEERS.

A City, containing 150,000 inhabitants, has recently been entirely supplied with Tubes made at the above-named Works, and several others with populations nearly as great; in fact, the reputation now acquired induces this notice to the public.

Large Stocks generally on hand, averaging from one to three hundred thousand feet.

HYDRAULIC PRESS TUBES,
to resist 6000 lbs. and upwards to the square inch, extensively manufactured.

STOCK DIES and SCREWING TACKLE,
of the best possible description.

Every Tube carefully tested with Hydraulic Pressure before leaving the Works.

THOMAS PHILLIPS,
55, SKINNER STREET, SNOW HILL.
PATENTEE and MANUFACTURER of all kinds of Apparatus for Cooking, Heating Baths, Conservatories, &c., by Gas, and general Gas-Fitter by Appointment.

TO ENGLISH AND FOREIGN GAS COMPANIES, AND MANUFACTURERS OF GAS-METERS, FITTINGS, APPARATUS, &c.

THE Advertiser, having a competent knowledge of the above, is anxious to fill a Situation as CLERK, MANAGER, or INSPECTOR. Satisfactory references, and security if required.

Would take a Situation as Clerk or Traveller for a Manufactory of Gas-Meters, Fittings, Apparatus, &c.

Address J. S., 39, Lisle Street, Leicester Square, LONDON, W.

TO GAS CONTRACTORS AND OTHERS.

THE Directors of the Hythe and SANDGATE GAS and COKE COMPANY (Limited) are desirous of receiving TENDERS for the following articles:—

A GASHOLDER, 45 feet in diameter and 15 feet deep, with Six Columns, Girders, &c., and 6-inch Inlet and Outlet-Pipes, complete.

A Cast-Iron TANK, to receive the above Gasholder.

A PURIFIER, Six feet square, with Wrought-Iron Sieves and 6-inch Inlet and Outlet-Valves, complete.

A 5-inch BOX CONDENSER, 120 yards of 6-inch Socket-Pipe, Two Syphons, Ten Bends, and Two Tees.

Each Tender to be accompanied by Tracings and details of each article, and to state the price of each article.

Tenders to be sent on or before Saturday the 30th of July instant, addressed to Mr. EDWARD WATTS, Solicitor, Hythe, KENT.

The Directors do not bind themselves to accept the lowest or any Tender.

By order of the Directors,
EDWARD WATTS, Secretary.
Hythe, July 14, 1859.

METROPOLITAN BOARD OF WORKS.
MAIN DRAINAGE OF THE METROPOLIS.
SOUTHERN HIGH-LEVEL SEWER.
TO BUILDERS, CONTRACTORS, AND OTHERS.

THE Metropolitan Board of Works hereby give notice, that they will MEET at the Council-Chamber, Guildhall, in the City of London, on FRIDAY, the 22nd day of July inst., at Twelve o'clock at noon precisely, and will then be prepared to open TENDERS by parties who may be willing to CONTRACT for the CONSTRUCTION of MAIN BRICK SEWERS, 9 miles 2940 feet in length, or thereabouts, and for the execution of other works in connexion therewith, to extend from Deptford Creek to High Street, Clapham. Also, a Branch to extend from the Broadway, Deptford, to the point of junction with the Effra Sewer, in Croxted Lane, Dulwich; and for the maintenance of such works in complete repair for twelve calendar months.

Parties desiring to submit Tenders may, upon payment of £3, obtain Plans, Sections, Specification, Form of Tender, and other particulars, on application at the office of the Board, between the hours of Nine a.m. and Four p.m.

Tenders addressed to the Metropolitan Board of Works must be delivered at the office of the Board, No. 1, Greek Street, Soho, before Four o'clock p.m. on Thursday, the 21st day of July inst., and no Tender will be received after that hour.

The Board do not bind themselves to accept the owest or any Tender, and the party whose Tender shall be accepted will be required to provide two approved sureties for the due performance of the works.

E. H. WOOLRYCH, Clerk of the Board.
No. 1, Greek Street, Soho, July 2, 1859.

KINSON FIRE BRICKS are indestructible by heat, and are warranted to last twice as long as Stourbridge, Newcastle, or Welsh bricks. 80s. per 1000 at Nine Elms Station.
WORKS: POOLE, DORSET.

WROUGHT-IRON Guides for Gasholders.—Designs and Working Drawings for Trussed Wrought-Iron Guides and Frames can be obtained of CHARLES DIXON, C. E., Chichester, SUSSEX.

CAST-IRON Retorts, Socket Pipes, with Syphons and all requisite Connexions, Lamp Columns, Wrought Iron Tubing, Valves, Street Lamps, Sight Holes, Furnace Doors, Ash Pans, Charging and Coke Shovels, Iron Pails and Coke Barrows, Cross Bars, Fire Pots, Pumps, Iron Borings.

PURIFIERS, CONDENSERS, and SCRUBBERS erected complete, or the materials supplied; with every description of goods in use by Gas-Works, in stock, on wholesale prices, at

LYNCH WHITE'S,
Old Barge Iron Wharf, Upper Ground Street,
LONDON.

TO GAS & WATER COMPANIES, ENGINEERS' AND FITTERS.

GARSIDE'S Registered Tube-Vice holds all sizes of Wrought-Iron and Brass Tubes with the greatest firmness and least possible pressure; consequently it is not so liable to split or damage the Tubes as the ordinary Vice, and considerably facilitates the Workman, who may do almost double the quantity of work. Also,

GARSIDE'S IMPROVED MAIN-DRILLING CLIPS, for Drilling Holes for Service-Pipes. With this instrument the perforation of Pipes for the attachment of smaller Tubes can be effected with great ease and precision. Likewise,

HEAP'S REGISTERED GAS TONGS, most highly approved of as vastly superior to those in present use. Stocks, Taps, and Dies, together with all tools connected with Gas Engineering.

For Drawings, Testimonials, and prices, apply to the Maker, S. GARSIDE, Stamford St., ASHTON-UNDER-LYNE.

WATER-WORKS.
CONTRACT No. 5.
TO BRASSFOUNDERS AND OTHERS.

THE Local Board of Health for the district of Wallasey, in the county of Chester, do hereby give notice that they are prepared to receive TENDERS from parties willing to undertake the following named Contract:—

Contract No. 5. For the SUPPLY of SLUICE VALVES, HYDRANTS, and other STREET FITTINGS.

Duplicate Specifications, forms of Tender, and schedules of prices may be obtained on payment of 10s., on application to JAMES T. LEA, Resident Engineer, at the Offices of the Local Board, or at the Office of ROBERT RAWLINSON, Civil Engineer, No. 34, Parliament Street, WESTMINSTER, on and after Monday, the 4th of July next, between the hours of Ten a.m. and Three p.m.

The Contractor will be required to enter into a bond, with two approved sureties, for the due performance of the contract, which contract and bond will be prepared at the expense of the Contractor.

Sealed Tenders to be delivered at the Public Offices, EGREMONT, near BIRKENHEAD (law-clerk's office), on or before Four o'clock in the afternoon of Wednesday, the 20th of July next, endorsed "Tender for Contract No. 5, Water-Works."

No Tender will be entertained unless made in the prescribed form, and the Board do not bind themselves to accept the lowest or any Tender.

By order,
T. K. HASSALL, Clerk to the said Board.
Public Offices, Egremont, near Birkenhead,
June 28, 1859.

FIRE-CLAY RETORTS.

JOHN SWARBRICK,

MANUFACTURER OF PATENT COMPOSITION CLAY RETORTS,

FIRE BRICKS OF EVERY DESCRIPTION, SHAPE, AND SIZE, &c. &c.

HIGHER EANAM, BLACKBURN, LANCASHIRE.

These RETORTS are generally used in the Gas-works of Preston, Accrington, Bury, Heywood, Middleton, Rochdale, Ratcliffe; the Mills of Messrs. Horrocks, Miller, and Co., Preston, &c. &c., and are unequalled in having afforded general satisfaction to those who have given these Retorts a trial.

To meet the increasing demand, the Works at Little Harwood have been greatly enlarged; and Gas Engineers who may favour with an Order may rely with confidence on their being promptly supplied with an article not to be surpassed in finish or durability.

PRICES MODERATE.

WILLIAM PARKINSON AND CO.,

(SUCCESSORS TO THE LATE SAMUEL CROSLEY,)

COTTAGE LANE, CITY ROAD LONDON,

Beg to announce that, in addition to the Manufacture of

GAS-METERS,

they continue the Manufacture of

METERS FOR MEASURING WATER, SPIRITS, &c.,

commenced, under Patent in 1849, by the late Mr. William Parkinson.

These Meters are as simple and durable as the Gas-Meter, and as correct as that instrument in the registration of the fluids passing through them.

MERTHYR TYDFIL WATER-WORKS.
TO BUILDERS AND CONTRACTORS.

THE Local Board of Health of MERTHYR TYDFIL are desirous to receive TENDERS for the Construction of an ENGINE and BOILER-HOUSE, DEPOSITING TANKS, FILTER-BEDS, TWO COVERED SERVICE-RESERVOIRS, TWO COTTAGES, and other WORKS connected therewith.

Drawings may be seen, and printed Specifications, Bills of Quantities, and Forms of Tender may be had (price £2. 2s. each set), on application to me; or to Mr. HAWKSLEY, C.E., 30, Great George Street, WESTMINSTER, S.W., on and after Monday, the 18th day of July instant; and Sealed Tenders must be delivered at my Office not later than Wednesday, the 27th day of July instant. By order.

J. W. RUSSELL,
Clerk of the said Local Board.

Merthyr Tydfil, July 14, 1859.

MERTHYR TYDFIL WATER-WORKS.
TO ENGINE MAKERS.

THE Merthyr Tydfil Local Board OF HEALTH are desirous to receive TENDERS for a pair of High-Pressure Condensing ENGINES, with Boilers, Pumps, and Apparatus complete.

The Drawings may be inspected at my Office, or at the Office of Mr. HAWKSLEY, Civil Engineer, 30, Great George Street, WESTMINSTER, on and after Wednesday, the 27th of July inst., where Specifications and Forms of Tender may be had on payment of the sum of 10s. each.

Tenders must be delivered on or before Wednesday, the 10th day of August next. By order,

J. W. RUSSELL, Clerk to the Local Board.

Merthyr Tydfil, July 20, 1859.

WILLIAM STEPHENSON & SONS,
THROCKLEY,
NEWCASTLE-ON-TYNE,
MANUFACTURERS OF EVERY DESCRIPTION OF
FIRE BRICKS, CLAY RETORTS, LUMPS, TILES,
&c. &c.

LONDON OFFICES:
76, KING WILLIAM STREET, CITY.

A large stock of Fire-Clay Goods always on hand in London, at the lowest wharf prices, at Messrs. CHRISTIE & Co.'s Wharf, 64, Bankside, SOUTHWARK.

WILLIAM RYDER, General MINERAL AND METAL AGENT AND MERCHANT, 4, DEAN STREET,
NEWCASTLE-ON-TYNE,
is prepared to supply Gas and Water Companies with Apparatus and Appliances of every description, including Cast and Wrought Iron Goods, Coals, Fire-Bricks, Retorts, &c. &c.

Any communications addressed to him as above shall have prompt attention.

M. SHEEN, Gas and Railway Lantern Maker, 90½, Holborn Hill, begs to inform Managers of Gas-Works, &c., that she continues to contract and supply Lanterns on reasonable terms, and keep them in repair by the year.

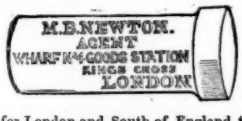
WHITEHOUSE and CO., Boiler and **GASHOLDER MAKERS,**
GLOBE PATENT TUBE WORKS,
WEDNESBURY,
Beg to draw the attention of Engineers and Managers of Gas Works to the superior quality of the Article they manufacture, both in respect of the iron employed, and the perfect manner in which it is welded; in proof of which they can refer to the testimonials of the most eminent Gas Engineers, and the experience of the principal of the large Gas Companies of the kingdom.
Orders promptly executed.

By Royal Letters Patent.

KAY'S Patent Equitable Gas-Meter is the most effective preventive of fraud by "tilting," and is as simple in construction as the common meter.

Manufactured only by
W. COWAN,
60, BUCCLEUCH STREET,
EDINBURGH;
AND
COMMERCIAL CHAMBERS,
RIDINGS COURT, ST. MARY'S GATE,
MANCHESTER.

J. CLIFF'S Fire Bricks, Clay RETORTS, &c.



Orders for London and South of England to be addressed to Mr. NEWTON, Agent for the District, 16, Castle Terrace, New Hampstead Road, KENTISH TOWN, N.W.

N.B.—A few Retorts of each size, and a large stock of Bricks and Lumps, always on hand at the above Wharf.

GEORGE ANDERSON, Gas and CONSULTING ENGINEER,
104, LEADENHALL STREET, LONDON (E.C.).
DIRECT-ACTING GAS-EXHAUSTERS,
supplied either with or without Steam-Engines and Boilers.

FOUR-WAY DIAPHRAGM VALVES,
one of which answers the purpose of THREE ordinary Valves, as applied to Purifiers, or in shutting off and passing Station-Meters, Governors, or other apparatus, while the Connecting-Pipes are also much simplified.

RETORT SETTINGS,
designed to be heated by Tar alone, and with a total absence of Smoke.

Illustrated circulars, giving references and every information, may be obtained on application as above.

WALTER MABON, Engineer,
ARDWICK IRON WORKS, FAIRFIELD STREET
MANCHESTER,
Manufacturer of
IRON TANKS for Gasholders, Railway Stations, &c.

GASHOLDERS.—Extensive premises at Gorton, solely for the manufacture of Gasholders, and other heavy Wrought-Iron Structures.

GAS APPARATUS.—W. M. has an extensive assortment of patterns for Purifiers from 4 feet to 15 feet square, also round ones from 4 feet to 10 feet diameter; Scrubbers, Condensers, Washers, Columns, Girders, and Tripod Patterns, suitable for Gasholders, from 10 feet to 150 feet diameter, either Single-lift or Telescope. Contractor for Gas Works of any Magnitude. Designs, Specifications, and Estimates furnished.

WROUGHT and CAST IRON ROOFS for Railway Stations, Gas Works, Warehouses, and Sheds, prepared for Slates or for Corrugated Iron.

IRON HOUSES, either for Dwellings, Manufactories, or Public Buildings.

PIPES and VALVES, for Gas and Water, from 2 inches to 48 inches bore.

TO THE GAS COMPANIES
OF GREAT BRITAIN AND THE CONTINENT

CANNEL AND COAL FOR GAS PURPOSES.—Fifteen years' connexion with one of the largest Gas Concerns in England, enables us from practical experience to certify that the CANNEL and COAL we offer are those best suited for Gas purposes.

On application, we shall have much pleasure in forwarding our Tabulated Statements of Analyses, with Prices and Terms; also References as to respectability.

All Contract Orders have our careful and best attention.

EMANUEL TURNER and Co., Exporters of Cannel and Coal, 34, Castle Street, LIVERPOOL.

WEST and GREGSON, Gas-Meter MANUFACTURERS, &c.
UNION STREET, OLDHAM.

Station and Experimental Meters, Gas Pressure Registers, Gauges, Experimental Gasholders, Governors, Slide Valves, &c. &c.

W. and G. would respectfully call the attention of Gas Engineers and Managers to their Station-meters, having made and erected the largest in use at the present time, two of which may be seen at the Stockport and Liverpool Gas Works, on application to the respective Engineers.

WILLIAM CLIBRAN'S Patent
MERCURIAL GAS-GOVERNOR FOR STREET LAMPS.

W. C. begs respectfully to call the attention of Gas Companies to his PATENT GAS-GOVERNOR for STREET LAMPS, upwards of 3000 of which are now in use on Public Lamps. By their use any given quantity of Gas per hour may be consumed with the tap full open whatever the increase of pressure may be, thus preventing a great waste of Gas in many of the Lamps, and securing to the public an uniform light. Prices, 3s. 4d., 3s. 6d., and 3s. 8d. each.

Governors kept in stock from three-eighths of an inch to four inches bore.

Samples and Testimonials forwarded on application to WILLIAM CLIBRAN, 43, Todd Street, MANCHESTER

ALFRED PENNY, Engineer,
WENLOCK IRON WORKS,
WHARF ROAD, CITY ROAD, LONDON.

Mr. PENNY begs to inform Gas and Water Companies that he undertakes the erection of new, or the alteration of existing, works; and that he may be consulted generally on all matters connected with gas and water supply. He is also prepared to supply best Cold-blast Retorts, Socket-Pipes, and Connections, Iron Borings, &c. &c., and all the necessary Castings used in Gas and Water-Works.

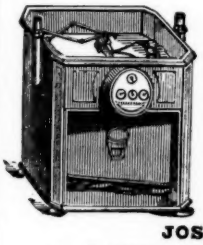
•• Country orders executed with care and despatch.

ROBERT MACLAREN and CO.,
EGLINTON FOUNDRY, GLASGOW,
Manufacturers of all sizes of Cast-Iron Main Pipes, by an improved Patent. General Ironfounders, Gas Engineers, and Wrought-Iron Tube Makers.

BENJAMIN GIBBONS, Jun., DEEPDALE FIRE-CLAY & BRICK WORKS,
Near DUDLEY,
Manufacturer of every description of Fire-Bricks, Lumps, Quarries, Shields, Flue Covers, &c., to any size or shape required.

FIRE-CLAY RETORTS,
TO MODEL OR DRAWING.

B. G. begs to call the attention of Gas Companies to his Fire-Clay Retorts, which have been used with great satisfaction in some of the largest Gas-Works in the Metropolis and many Provincial Towns in England.
References given, if required.



BOULTON'S PATENT
DRY GAS-METERS,

Of which upwards of 24,000 are at present in use, having gained for themselves an unparalleled patronage from all the principal Gas Companies and Consumers, on account of their unerring registration and the superior workmanship and materials used in their construction, enables the Patentee to sell them now at competitive prices with those of other makers.

Every description of Improved Wet or Patent Dry Meters and Gas Apparatus manufactured by

JOSEPH BOULTON,
28, BAGNIGGE WELLS ROAD, CLERKENWELL.

THE UNIVERSAL
GAS-BURNERS REGULATOR,
(GEYELIN'S PATENT,)

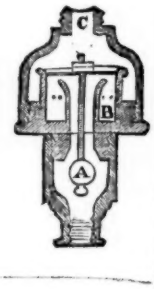
The only one in the world by which the flame from Argand, Fish-tail, and all other Burners remain invariable under all variations of pressure, and the cost of each light is less than one farthing per hour.

Can be fixed horizontal, close to, or distant from, the Burner; is ornamental, simple in construction, consisting of a double chamber, the inner perforated, covered with a diaphragm giving action to a spherical valve.

PRICE 3s. EACH.

Can at all times be seen tested at the Manufacturer's,

JOSEPH BOULTON
28, BAGNIGGE WELLS ROAD.



JAMES OAKES and CO.,
ALFRETON IRON WORKS, DERBYSHIRE,
AND
WENLOCK IRON WHARF, 20, WHARF ROAD,
CITY ROAD, LONDON,
Beg to inform Gas and Water Companies and the public, that they keep in stock in London all the CASTINGS in general use in Gas and Water Works, including best cold-blast Iron Retorts, Socket and Flange Pipes of all sizes, Bends, Branches, Syphons, Lamp Columns of various patterns, &c.

N.B.—Orders for Cast-iron Tanks, Girders, Columns, Cylinders, and all irregular castings, will have immediate attention.

CHARLES HORSLEY, Agent.

C. H. is prepared to carry out the warming and ventilation of public buildings, &c.; also civil engineering in general.

F. & C. OSLER,
44, OXFORD STREET, LONDON;
Manufactory—Broad Street, Birmingham—Established 1807,
MANUFACTURERS OF GLASS CHANDELIERS, GLASS LUSTRES, TABLE GLASS, &c. &c.

ELEGANT CRYSTAL GLASS CHANDELIERS, for GAS, from £4 upwards (Made from "REGISTERED" DESIGNS), with GLASS BRANCHES, &c.; suitable for DRAWING-ROOMS and BALL-ROOMS. The more extensive use of GAS in private dwellings has induced Messrs. OSLER to direct their particular attention to the manufacture of this class of articles—which, with a view to their general adoption, are offered at very moderate prices. Purchasers can select from a great variety of patterns, to which additions are being constantly made.

THEATRES, CONCERT, ASSEMBLY, AND BALL ROOMS LIGHTED BY ESTIMATE ON THE LOWEST TERMS.

ESSON'S PATENT
COMPENSATING GAS-METER

Affords *absolute security* both to Gas Companies and Consumers, by maintaining a *constantly accurate Water-Level under all circumstances*, by means so simple and effective as to baffle and remove those objections which have been successfully urged against other complicated contrivances professing the same object.

MANUFACTURED ONLY BY

WILLIAM COWAN,

Buccleuch Street Works, EDINBURGH;

AND

Commercial Chambers, Ridings Court, St. Mary's Gate, MANCHESTER.

ESTABLISHED 1827.

By Her Majesty's Royal Letters Patent.

JAMES MEACOCK,

PATENT DRY and IMPROVED WET GAS-METER WORKS,

7, SNOW HILL, AND 16, WEST STREET, LONDON.

ESTABLISHED 1836.

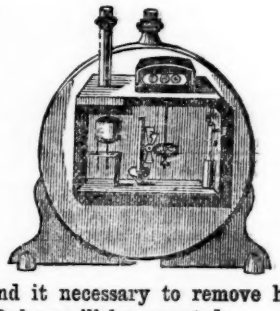
J. MEACOCK begs to call attention to his patent method of securing the Leather diaphragm of his Dry Meter. Instead of using the soldering iron for this purpose, it is held between two flat Metal Rings, and screwed up sound to a metal frame, as shown in the drawing.

By this improvement the perishing effect of hot tools to leather being avoided, its durability must be longer; also, its repair when needful is most simple, as a new leather diaphragm can be applied by merely unscrewing the old one from the rim or frame to which it had been screwed up.

Meters of Gas Companies being subject to so much wear and tear, J. M. begs leave to assure those who may honour him with their commands, that nothing but the stoutest materials for cases, the hardest gas-resisting metals, and best foreign leather for the interiors, will be used, and none but first-class workmen employed in their construction.

Wet Gas-Meters Repaired and Reconstructed with J. Meacock's Modern Improvements.

METERS SENT ON APPROVAL.



In consequence of the great demand for the above Meters, J. Meacock has found it necessary to remove his Manufactory to more extensive Premises, 16, West Street, Smithfield, where Orders will be executed on the shortest notice.

EDWARD COCKEY & SONS'

PATENT GAS VALVES.

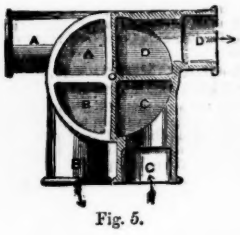


Fig. 5.

THESE Valves are formed of two cast-iron cylinders, with segmental divisions, having faces ground gas-tight, the upper cylinder turning horizontally on the lower one.

The lower cylinder has pipes from each division communicating with the vessels to and from which gas is to be passed. The upper cylinder has corresponding divisions, so arranged as to direct the passage of gas to the different segmental divisions in the lower part, and when it is turned on the face of the lower one to alter the flow of gas from one vessel to another.

Fig. 6.

Fig. 5 represents the Valve arranged for a bye-pass, in which, by turning the upper cylinder, Fig. 6, the Gas is directed either through the bye-pass, or through the vessel to which it is attached.

Another arrangement is just completed for two purifiers, by which the Gas may be directed through both purifiers together, entering either first, or through either purifier separately. The advantages of this arrangement will be too manifest to Gas Manufacturers to need comment.

The Valves are manufactured by the Patentees at their

IRON WORKS, FROME SELWOOD.

The following Testimonial has been received from an eminent Engineer:—

Gaslight and Coke Company's Office, Cheltenham, Jan. 17, 1859.

Messrs. Cockey and Sons, Frome.

Gentlemen,—The Patent Purifier Centre Valve which I had fixed instead of the common hydraulic valve for one of our sets of purifiers with 9-inch connexions, I am happy to say continues to afford satisfaction both to myself and to the workmen who have the charge of it.

I am, Gentlemen, yours truly, W. ESSON.

EDWARD COCKEY AND SONS

ALSO MANUFACTURE

PURIFIERS, SCRUBBERS, CONDENSERS, AND OTHER IMPROVED GAS APPARATUS,

HAVING PATTERNS SUITABLE FOR GAS-WORKS OF DIFFERENT SIZES.

FIRE-CLAY GAS RETORTS.

ESTABLISHED IN 1795.

JOSEPH CLIFF,

WORTLEY FIRE-BRICK WORKS, near LEEDS.

THESE RETORTS are unrivalled in excellence, being the BEST FINISHED INTERNALLY, and THE MOST CORRECT IN FORM, of any in the Kingdom. From the peculiar composition used in working up the face of the material, they are rendered unusually smooth, close, and FREE FROM SURFACE CRACKS, thus, in a great measure, preventing leakage and the adhesion of carbon to their interior surface.

To meet the yearly increasing demand of UPWARDS OF THIRTY SEASONS and to carry out the late improvements in the manufacture, the Premises have been re-erected and much enlarged, and Engineers may rely WITH CONFIDENCE on their orders being completed with a greater regard to despatch than by any other House.

THE WORKS ARE WELL SITUATED

For EXPORT from the Ports of { LONDON, LIVERPOOL, HULL, MIDDLESBRO', HARTLEPOOL, and STOCKTON.

FIRE-BRICKS, LUMPS, GUARDS, TILES, AND CLAY OF THE SAME QUALITY.

M. B. NEWTON, London Agent, No. 4, Wharf, King's Cross Goods Station.

PADDON and FORD respectfully invite the attention of Gas Companies and Managers to their PATENT STREET LAMP REGULATOR, which ensures any required consumption.

By its use a great saving is effected, and the item of "Unaccounted-for Gas" considerably decreased.

PADDON and FORD, Patent GAS-METER AND APPARATUS WORKS, GRAY'S-INN-ROAD, LONDON,

Manufacturers of WET and DRY GAS METERS, STATION METERS, GOVERNORS, EXPERIMENTAL APPARATUS, LANTERNS, &c. &c.

Contractors for the erection or alteration of Gas-Works; and every description of Apparatus required in Gas-Works supplied.

GEORGE CUTLER, Gasholder MAKER,

No. 8, WENLOCK-ROAD, CITY-ROAD, LONDON.

Contracts for Tanks, Gasholders, Roofs, Purifiers, and all descriptions of Gas Apparatus executed on the most reasonable terms. Improved Slide Valves, Steam, and Range Boilers, and Smiths' Work, of the best materials and workmanship.

"ALL DOUBTS REMOVED."

DEFRIES' celebrated Dry Gas-METERS, of which there are 80,000 in use in Palaces, Churches, Chapels, Royal Dock-yards, Club Houses, Public Offices, and other buildings throughout the Empire, the Continent, and Colonies.

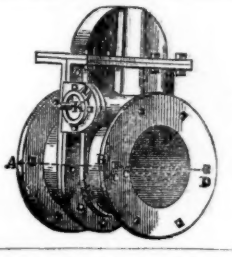
His meter for 1500 lights, in use upwards of ten years at the Royal Italian Opera, until that building was destroyed by fire, was long afterwards dug out of the burnt ruins, then tested by the Chartered Gas Company and found inflexibly correct.

On the 9th of June, 1858, at the Western Gas Company, his meter for 150 lights, after considerable use, was doubted, and subjected to the most variable tests, from the full lighting down to a single jet, and in each case, as in numerous other instances, accuracy was finely indicated.

His two large meters at the Thames Tunnel have been in constant use day and night for upwards of twelve years (one continuation of dark hours), subjected to the wear and tear of 75 years, as compared with the ordinary hours of using gaslight above ground.

Gas Companies honouring Mr. Defries with their commands for his PATENT DRY METER, which has done so much service in simplifying the fitting up of gas, as well as checking surreptitious burning, will be guaranteed perfection for five years free of charge.

Defries' Prize-Medal Gas Baths, Gas-Cooking and Heating Stoves. The Polytechnic Gas Fire, with indestructible fuel, in daily operation (Saturday excepted) at the Office, 406, Euston Road, Fitzroy Square, LONDON.



BRYAN D NKIN & CO.

keep always on stock their

IMPROVED GAS VALVES,

from 2 inches to 18 inches, price 11s. 6d. to 13s. 6d. per inch diameter.

List of prices, with full dimensions of all sizes up to 27 inches, to be had on application.

These Valves are all proved to 30 lbs. on the square inch before leaving the works.

BRYAN DONKIN & CO.,

ENGINEERS,

NEAR GRANGE ROAD, BERMONDSEY.

BIRTLEY IRON WORKS, CHESTER-LE-STREET, DURHAM.

Manufactory for every description of Casting and Machinery for Gas Works and Water Works.

Warehouse in London for Cast-iron Pipes and Connections of all sizes and in any quantity, Scott's Wharf, Bankside, Southwark.

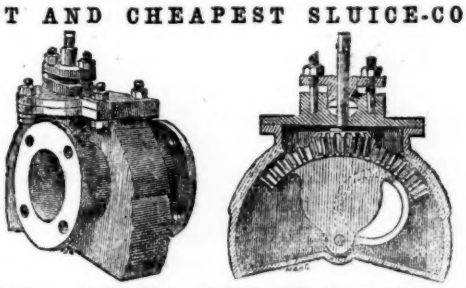
Office in London, Mr. E. M. PERKINS, 78, Lombard Street.

HARRIS and PEARSON PROPRIETORS OF BEST CLASS-HOUSE POT AND CRUCIBLE CLAY. MANUFACTURERS OF **FIRE BRICKS GAS RETORTS &C.**

AMBLECOTE FIRE CLAY AND BRICK WORKS, STOURBRIDGE.

Late in the occupation of I. and W. King. Originally J. Pidcock, Esq.

BEST AND CHEAPEST SLUICE-COCK.



BROWN AND MAY'S PATENT.

Above 3-inch diameter, price 10s. per inch. Brass face, 6d. per inch extra.

Can be taken to pieces without being removed from the line of Piping.

NORTH WILTS FOUNDRY, DEVIZES.

Wholesale Agents, Messrs. S. and E. RANSOME, 31, Essex Street, Strand, E.C., Where a Sample may be seen.

WILLIAM INGHAM AND SONS,

WORTLEY FIRE-BRICK AND RETORT WORKS,

Near

Leeds.

W. INGHAM and SONS, having for many years been extensively engaged in the Manufacture of

RETORTS AND FIRE-BRICKS FROM THE CELEBRATED WORTLEY FIRE-CLAY,

beg to call especial attention to their RETORTS, which have for many seasons proved to be unsurpassed in quality by any in the Kingdom, their FREEDOM FROM CRACKS and the ADHESION OF CARBON rendering them worthy the attention of all parties interested in the making of Gas.

The Works are of such magnitude as to ensure the prompt execution of orders to any extent.

Estimates for Setting, or Bricklayers sent when required.

GAS OVENS IN SEGMENTS OF EQUAL QUALITY.

London Agents: CHADWICK and AKEROYD, Willington Stone Wharf, Regent's Park Basin.

A large stock of Fire-Bricks, Fire-Clay, Terra Cotta, and Drain-Pipes of all sizes kept in London at CHRISTIE & CO.—Wharf, 64, Bankside, Southwark, where all particulars of Prices, &c., may be obtained.

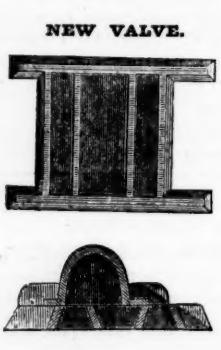
N.B.—*Export orders continue to have prompt attention.*

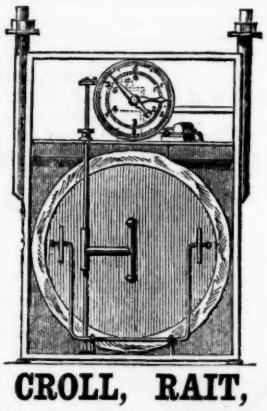
ALEXANDER WRIGHT,

GAS ENGINEER, MANUFACTURER OF GAS-METERS, GOVERNORS, AND EVERY DESCRIPTION OF GAS APPARATUS,
55, MILLBANK STREET, WESTMINSTER.
CONSUMERS' METERS at the List Price, with a Liberal Discount to Wholesale Purchasers.
THOMPSON'S BROMINE TEST, £1. 1s.—BROMINE, 3s. per Ounce.
BISULPHURET OF CARBON TEST, £2. 2s.
APPARATUS FOR DETERMINING THE HEATING POWER OF SAMPLES OF COAL AND OTHER DESCRIPTIONS OF FUEL, £5. 5s.,
INVENTED BY LEWIS THOMPSON, ESQ., M.R.C.S.
REGISTERING PRESSURE GAUGE, Net Price, £8. Glass Shade, 10s. extra.
STATION METERS, PRESSURE GAUGES, PHOTOMETERS, SPECIFIC GRAVITY APPARATUS, &C.

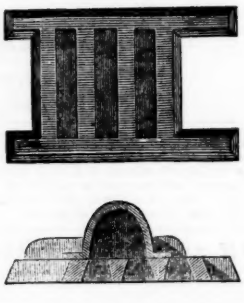
CROLL'S
PATENT IMPROVED DRY GAS-METER,

NEW VALVE.





OLD VALVE.



Manufactured by CROLL, RAIT, and CO., LONDON.
FACTORY—Canal Bridge, Kingsland Road, N.E.

MESSRS. CROLL, RAIT, and Co. having stated that the New Valve is an improvement to Mr. CROLL'S DRY GAS-METER, have much pleasure in supporting that statement by the opinion of practical men. They have authority to say that the following gentlemen, connected with the London Gas Companies, consider the alterations lately made, *especially those affecting the Valves*, to be important improvements therein.

GEORGE LOWE, F.R.S., Consulting Engineer to the		Chartered Gas Company.
WILLIAM MANN, Engineer	„	City of London Gas Company.
ROBERT JONES, Engineer.	„	Commercial Gas Company.
HUNTER JONES, late Engineer	„	Equitable Gas Company.
JOSEPH CLARK, Engineer	„	Imperial Gas Company.
THOMAS KIRKHAM, Engineer . . .	„	
DAVID METHVEN, Engineer	„	
ROBERT LAING, Engineer and Secretary. .	„	Independent Gas Company.
RICHARD JONES, Engineer	„	London Gas Company.
WILLIAM INNES, Engineer	„	Phœnix Gas Company.
GEORGE WILTON, Resident Engineer . .	„	Ratcliff Gas Company.
THOMAS LIVESEY, Engineer and Secretary.	„	South Metropolitan Gas Company.
DAVID HUNTER, Jun., Resident Engineer .	„	Surrey Consumers' Gas Company.

This opinion is also confirmed by
JOHN KIRKHAM, Civil and Consulting Gas Engineer.
R. M. CHRISTIE „ „
THOMAS G. BARLOW „ „

D. HULETT and CO., 55 and 56, HIGH HOLBORN, LONDON,
PATENTEES and MANUFACTURERS of the ONLY GOOD MERCURIAL GAS REGULATOR,
invite the attention of Gas Companies and the Trade generally to their Improved GAS-METERS, which they warrant equal to any in Quality, Workmanship, and Simplicity of Construction, and the only Meters from which Gas cannot be obtained without being duly registered.

MANUFACTURERS OF
GAS CHANDELIERS, GLASS LUSTRES, HALL LANTERNS, VESTIBULES, BRACKETS, PENDANTS;
DOUBLE CONE, ALBERT, SHADOWLESS, & EVERY DESCRIPTION OF BURNER, UNION JETS, BATSWINGS, ETC.;
IMPROVED FULL-WAY CARTER'S VALVES (much approved of);
GAS-STOVES, and every article connected with Gas Apparatus.
CAST & WROUGHT-IRON PIPE, BLACK & GALVANIZED. COPPER. TIN, BRASS, & COMPOSITION TUBING.
D. HULETT'S IMPROVED SERVICE CLEANSER
for clearing out Mains, Services, and Interior Fittings—60s. net.
Boyle's Patent Silvered Glass Combination Reflectors and Outside Lanterns.
Sole Manufacturers of Church and Mann's Photometer.
Large Pattern Books, with every description of Gas-Fittings, Chandeliers, &c., with complete Book of Prices, 12s.

London: Printed by WILLIAM BOUGHTON KING (at the office of Joseph Clayton, 17, Bouverie Street, Fleet Street); and published by him at No. 11, Bolt Court, Fleet Street, in the City of London.—Tuesday, July 19, 1859.